LEAD AND COPPER RULE
GUIDANCE MANUAL

Volume I: Monitoring

for

Drinking Water Technology Branch
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Preface

On June 7, 1991, the U.S. Environmental Protection Agency promulgated NPDWRs for lead and copper. EPA is developing a guidance manual in two volumes to assist water systems and State regulatory agencies in implementing the technical requirements of the rule. This first volume of the Lead and Copper Rule Guidance Manual addresses the monitoring requirements of the rule.

This volume discusses the monitoring requirements of the rule and provides recommendations to assist systems in the design of their monitoring programs. A high quality monitoring program is essential because the results will be used in the design of the corrosion control studies. For smaller systems, monitoring data can serve as the sole basis for the treatment recommendation. The monitoring data will also be used by the State to review the treatment recommendations submitted by water systems and to specify optimal water quality parameters. The manual provides guidance on identification of potential sample sites, selection of sample sites, procedures for homeowner participation, sampling procedures, and monitoring reporting requirements and deadlines.

I hope that this volume of the manual will be a practical tool for water systems and State regulatory agencies in implementing the monitoring requirements of the lead and copper rule.

James R. Elder

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CHAPTER 1.0 — INTRODUCTION

The 1986 amendments to the Safe Drinking Water Act (SDWA) require the Environmental Protection Agency (EPA) to promulgate drinking water standards for contaminants which impose potential adverse health risk. Lead and copper were specifically listed in the 1986 SDWA amendments for mandatory development of a National Primary Drinking Water Regulation. EPA responded to this mandate through the promulgation of the Lead and Copper Rule (56 FR 26460).

The issue of lead and copper in drinking water is one which has received considerable attention from the EPA, environmental and public health scientists, and the drinking water industry. The EPA believes that the most appropriate means of controlling potentially harmful exposures to these contaminants is a comprehensive treatment technique comprised of three major components: (1) treatment, including corrosion control and removal of excessive lead and copper from source water; (2) lead service line (LSL) replacement; and (3) public education.

EPA recognizes that a large portion of the lead and copper found in tap water is contributed by home plumbing materials, and that these materials cannot be controlled directly by public water suppliers. However, public water suppliers can control the introduction of lead due to elevated levels in the source water or corrosion within the distribution system. In addition, by requiring the installation of corrosion control treatment, EPA believes the introduction of lead and copper to potable water may be minimized.

A high degree of complexity is involved in assessing the interactions among corrosion control measures, overall treatment performance, and potential impacts on other water quality goals. In addition, no standardized approach or performance measure exists by which corrosion control treatment can be evaluated. Therefore, the design and implementation of "optimal" corrosion control treatment, as required by the Lead and Copper Rule, includes the flexibility necessary for the application of best professional judgement on the part of the water industry, consulting engineers, and regulators.

It is important, then, for all parties to remain mindful of the stated goal of the Rule: to minimize lead and copper at users' taps while ensuring that the treatment does not cause the water system to violate any national primary drinking water regulation. States and PWSs should consider the secondary impacts of alternative treatment approaches under review for the control of lead and copper, and incorporate these consequences into the decision-making process for defining optimal treatment.

INTRODUCTION

The Lead and Copper Guidance Manual is intended to provide supporting direction to States and public water suppliers so that the requirements of the Lead and Copper Rule may be achieved. The focus of the manual is to supplement materials readily available in the literature, referring to these information sources for further reading where appropriate, and to provide practical suggestions and recommendations for accomplishing the objectives of the Rule. This document is designed to provide technical guidance to primacy agencies administering the SDWA as they exercise their judgment in implementing the national primary drinking water regulations for lead and copper. This guidance is a general statement of policy which does not establish a binding norm on primacy agencies or public water systems and is not finally determinative of the issues addressed. Decisions made in any particular case will be governed by the applicable provisions of the SDWA and 40 CFR Parts 141 and 142.

The Guidance Manual is organized in two volumes to present supporting materials for each major implementation step in the Lead and Copper Rule. Volume I focuses on the development of the necessary sampling plan and monitoring program elements contained in the Rule. Volume II discusses the treatment studies which some PWSs may be required to perform and the identification of optimal treatment for recommendation by PWSs to the States. Volume II also presents information regarding full-scale treatment operational considerations.

A glossary of terms and acronyms used throughout the Guidance Manual is provided for easy reference immediately following this Chapter.

GLOSSARY OF TERMS

TERM	DESCRIPTION
Corrosion Control Treatment	Treatment to minimize the dissolution of lead and/or copper during water delivery to consumers.
First-Draw Tap Samples	One-liter samples collected from the kitchen or bathroom cold-water faucets of targeted sample sites representing water standing in the interior piping for at least six hours.
Lead Service Line Sample	One-liter samples collected from locations served by LSLs representing water standing in the LSL for at least six hours.
Materials Survey	An investigation of the materials used in home plumbing and service lines to assist PWSs in located targeted sample sites.
Sample Plan	A description of the sampling locations and criteria for targeted sample sites for first-draw tap, distribution system, and point of entry samples.
Sample Pool Category	Reflects the relative priority of targeted sample sites able to be identified and included in the sample plan for first-draw tap samples.
Source Water Sample	Samples collected at the entry point(s) to the distribution system representative of each source of supply after treatment.
Source Water Treatment	Removal of lead and/or copper from the source of supply.

ACRONYM	DEFINITION
AL	Action Level - the level of lead or copper in first-flush tap samples which when exceeded triggers additional compliance actions on the part of PWSs.
BLDGs	Public or commercial buildings served by the PWS.
BLDG>82	Public or commercial building constructed after 1982 with copper plumbing using lead-based solder.
BLDG<82	Public or commercial building constructed before or in 1982 with copper plumbing using lead-based solder.
BLDG-LSL	Public or commerical building served by a lead service line connection.
BLDG-Pb	Public or commerical building which has lead interior plumbing.
Cu	Copper
LSL	Lead Service Line.
LSLRP	Lead Service Line Replacement Program.
MFR>82	Multi-Family Residence constructed after 1982 with copper plumbing using lead-based solder.
MFR<82	Multi-Family Residences constructed before or in 1982 with copper plumbing using lead-based solder.
MFR-LSL	Multi-Family Residences served by a lead service line connection.
MFR-Pb	Multi-Family Residences which have lead interior plumbing.
MFRs	Multi-Family Residences.
NRs	Non-residential structures constructed in a similar manner as single-family residence.
NTNCWSs	Non-Transient, Non-Community Water Supplies
Pb	Lead
Pb/Cu-POE	Lead and Copper samples collected at the points of entry to the distribution system representative of each source of supply after treatment.
Pb/Cu-TAP	Lead and Copper Samples collected as first-draw tap samples from targeted sample sites.

ACRONYM	DEFINITION
POE	Points of Entry to the distribution system representative of each source of supply after treatment. Used to describe source water monitoring activity.
PQL	Practical Quantitation Level
PWS	Public Water Supplier
SFRs	Single Family Residences, which can include for purposes of identifying targeted sampling locations: (1) Non-Residential structures (NRs); and (2) Multi-Family Residences (MFRs) if they constitute more than 20% of the service connections within the PWS's service area.
SFR>82	Single-Family Residences constructed after 1982 with copper plumbing using lead-based solder.
SFR<82	Single-Family Residences constructed before or in 1982 with copper plumbing using lead-based solder.
SFR-LSL	Single-Family Residences served by a lead service line connection.
SFR-Pb	Single-Family Residences which have lead interior plumbing.
WQP	Water Quality Parameters, defined in the Rule to include pH, temperature, conductivity, alkalinity, calcium, orthophosphate, and silica.
WQP-POE	Water Quality Parameters measured at the points of entry to the distribution system representative of each source of supply after treatment.
WQP-DIS	Lead and Copper measured at representative locations throughout the distribution system.
90%TL	The 90% lead and/or copper level for first-draw tap samples collected at targeted sample sites.
90%TL-POE	The difference between the 90% lead or copper level for first-draw tap samples collected at targeted sample sites and the highest respective metal level measured at the points of entry to the distribution system.

CHAPTER 2.0 — GENERAL REQUIREMENTS

The Lead and Copper Rule promulgated National Primary Drinking Water Regulations (NPDWRs) for lead and copper on June 7, 1991 (56 FR 26460). Due to the difficulties in controlling all sources of lead and copper in drinking water via a single regulatory action, the EPA has taken a three-prong approach in the Lead and Copper Rule as illustrated in Figure 2-1. The three key elements of the Rule are treatment, public education, and lead service line replacement. Within the realm of treatment, public water suppliers (PWSs) may be required to (1) provide additional treatment at the plant for removing excessive levels of lead and/or copper from the source of supply (known as "source water treatment"); and/or, (2) develop, install, and operate "optimal" corrosion control treatment to minimize the dissolution of lead and/or copper during water delivery to consumers.

Public education must be delivered within 60 days after a system exceeds the lead action level (AL). Public education is performed continuously until the AL is met, and must be recommenced should the lead AL be exceeded in subsequent monitoring events. A Lead Service Line Replacement Program (LSLRP) is only required if a system which has identified lead service lines (LSLs) within the distribution system and exceeds the lead AL after corrosion control and/or source water treatment has been installed. At a minimum, PWSs must annually replace seven percent (7%) of the LSLs identified as long as the lead AL is exceeded; however, systems may waive replacement of individual lines where the lead concentration of a LSL sample is ≤ 0.015 mg/L.

This chapter summarizes the requirements of the Rule and the required State activities.

2.1 — General Requirements of the Lead and Copper Rule

Figure 2-2 presents the general requirements of the Lead and Copper Rule as related to the monitoring program and associated determination of compliance for PWSs. Three spheres of activity exist for PWSs: (1) at the points of entry to the distribution system reflecting source water conditions; (2) throughout the distribution system itself; and (3) in consumers' homes. Monitoring and compliance are based on the PWS activity within each of these locations with varying requirements by system size and results of the specific monitoring program.

Before monitoring can begin, PWSs must first develop a sample plan by (1)performing a materials survey of the distribution system and the interior plumbing conditions within the service area; and, (2) selecting appropriate sample sites using the criteria specified in the Rule for tap samples, representative locations for distribution system, and points of entry to the distribution system.

Figure 2-1. Key Elements of the Lead and Copper Rule

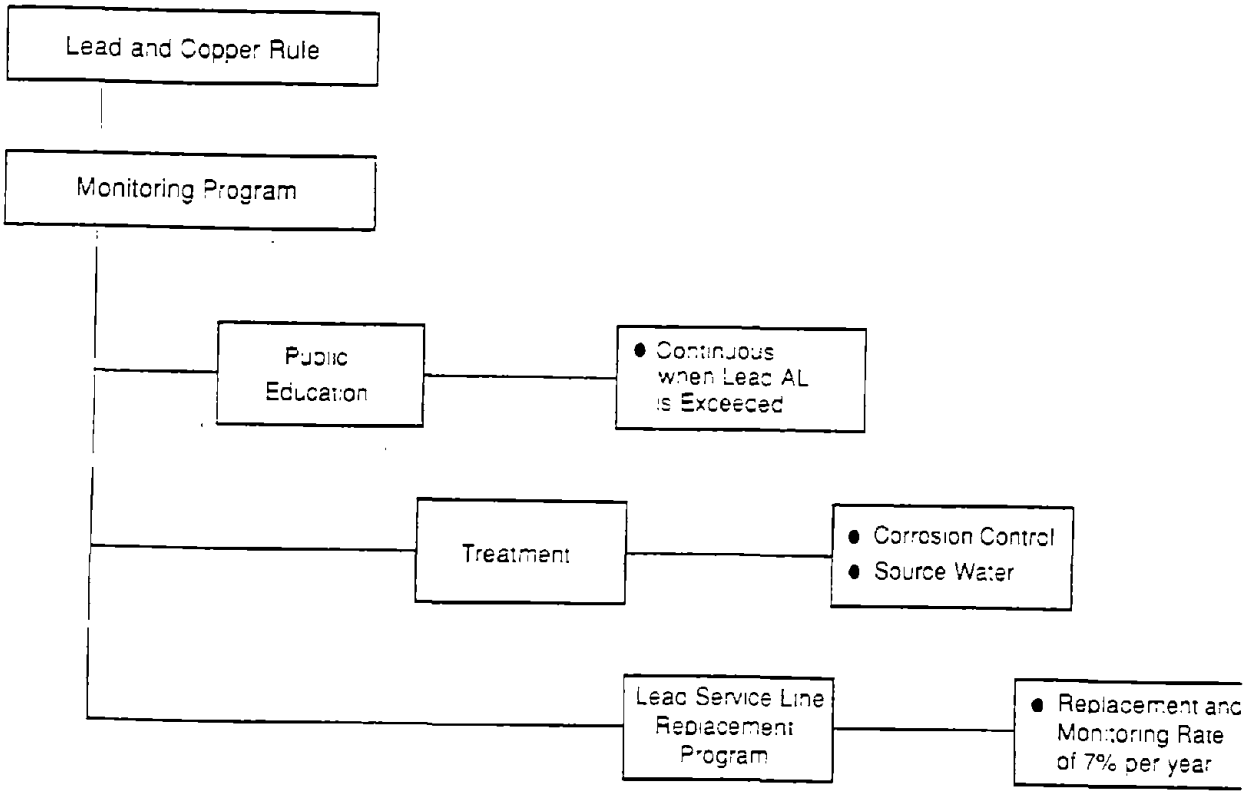
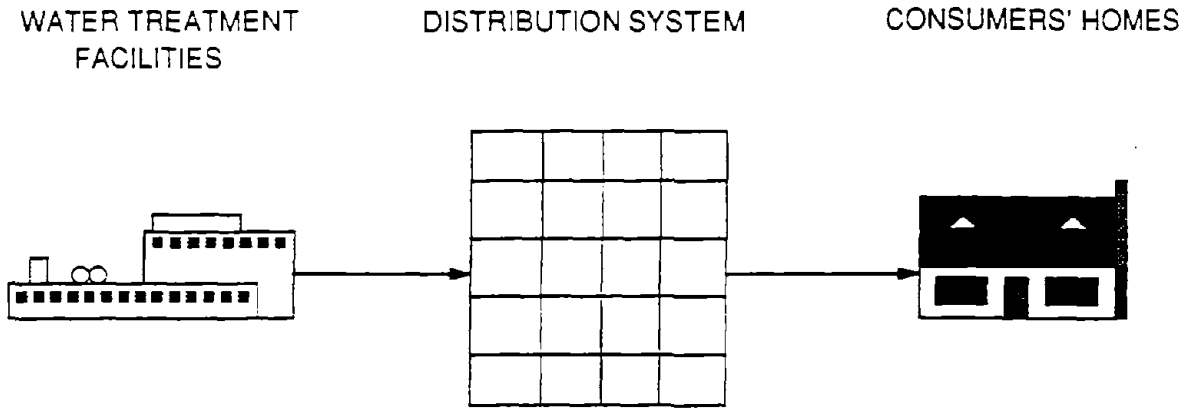


Figure 2-2. Key Components of the Lead and Copper Rule



MONITORING REQUIREMENTS:

Entry Points:	Distribution System:	First-draw Taps:
• Lead and Copper ✳ Source Water Treatment	• Water Quality Parameters:	• Lead and Copper
• Water Quality Parameters: ✳ Corrosion Control	✳ pH, temperature, calcium, alkalinity, conductivity, inhibitor	

APPLICABLE STANDARD:

PWSs Required to Meet WQPs	PWSs Required to Meet WQPs	PWSs Not Required to Meet WQPs
• Water Quality Parameters for Optimal Treatment	• pH >=7.0 (unless waived by state) • Other Water Quality Parameters for Optimal Treatment	• Action Levels: Pb: 90% <= 0.015 mg/L Cu: 90% <= 1.3 mg/L

Once a sample plan has been developed, PWSs are to perform *initial monitoring*, consisting of an initial set of samples to evaluate the existing lead and copper levels in first-draw tap samples. Large PWSs, those serving more than 50,000 persons, must also monitor specific water quality parameters at the entry points to the distribution system and at representative locations throughout the distribution system during the initial monitoring events. Source water monitoring for lead and copper is only required if the ALs in the tap samples are exceeded and/or if a PWS wants to demonstrate that the existing treatment is optimal by showing that the difference between the 90th percentile tap level and source water levels are less than the practical quantitation level. Medium PWSs (serving 3,300—50,000 persons) and small PWSs (serving ≤ 3,300) are only required to collect source water and distribution system water quality parameter samples should the Action Levels (ALs) for lead and/or copper be exceeded in the tap sampling events. Subsequently, a series of actions on the part of PWSs and States follows depending on the results of initial monitoring.

The following sections summarize in more detail the specific elements of the Lead and Copper Rule.

2.1.1 — Water Treatment Requirements

The control of lead and copper in drinking water is to be accomplished through the installation and operation of treatment. This can consist of two elements: treatment for the removal of lead and copper from the source of supply; and/or, treatment to reduce the corrosivity of the finished water towards lead and copper. All large PWSs will be required to conduct corrosion studies to determine optimal corrosion control treatment. Only those medium and small PWSs which exceed the ALs must recommend and install optimal corrosion control treatment. States may require that these smaller PWSs perform corrosion studies to support the recommended treatment.

EPA designated lead and copper action levels (ALs) to trigger the need for additional investigation or treatment on the part of medium and small PWSs, in addition to the public education and lead service line replacement requirements for all PWSs. The lead and copper ALs are as follows:

Lead AL:

≤ 0.015 mg/L in at least 90% of the samples

Copper AL:

≤ 1.3 mg/L in at least 90% of the samples

An initial step of any system's investigation when an AL is exceeded is to monitor the source water. This sampling is performed at the points of entry (POE) to the distribution system. The results of this monitoring will assist the PWS in determining whether unacceptable levels of lead and/or copper are originating from the facility's source of supply. Beyond this, these PWSs are required to recommend to the State the treatment technique and water quality parameters

which are found to minimize lead and copper levels contributed through corrosion and/or source water treatment for the raw water supply.

The State will review the recommendations made by PWSs and either approve the recommended approach or designate alternative treatment and/or water quality parameters (WQPs) for the control of lead and copper. For source water treatment, the State will determine whether installation of treatment is necessary to minimize tap levels. If such treatment is required, the system must recommend treatment and the State will either approve installation of that treatment or specify an alternate treatment. If installation of new facilities are required as a result of the State's action, then the Rule permits 24-months for its implementation, after which follow-up monitoring must be performed.

Those systems which still exceed the ALs in the follow-up monitoring (after installation of corrosion control or source water treatment, whichever occurs later) are required to take such subsequent actions as:

- continue or implement a public education program;
- begin a Lead Service Line Replacement Program (LSLRP) if lead service lines are present;
- adjust the treatment method in place if required by the State;
- continue to perform monitoring every 6-months until the ALs are met.

For those PWSs required to install treatment or which serve more than 50,000 people, compliance with the corrosion control treatment requirements is achieved by meeting the State-approved WQPs at the entry points and at locations in the distribution system. If the lead AL is exceeded, and a Lead Service Line Replacement Program (LSLRP) must be implemented, then failure to meet the LSLRP requirements would be a violation of the Rule.

The results of the follow-up monitoring program will be used to assist the utility in determining (1) the benefits of fine-tuning the treatment; (2) the stability of the treated water in the distribution system; and, (3) the lead and copper levels in tap samples *vis-a-vis* the requirements for public education and LSLRPs, as well as assessing the performance of the treatment implemented.

2.1.2 — Monitoring Program

The required monitoring program consists of five distinct stages of activity:

- Initial Monitoring is to be performed by all PWSs. However, the specific requirements vary depending on system size as follows.
  - A. Large PWSs. Initial monitoring consists of two consecutive six-month sampling periods and includes monitoring consumers' taps for lead and copper (Pb/CU-TAP), distribution system locations for water quality parameters (WQP-DIS), and points of entry to the distribution system for water quality parameters (WQP-POE). If the lead AL is exceeded as a result of either six-month monitoring event, public education must be initiated.

Large PWSs are not required to monitor for lead and copper at the points of entry to the distribution system (Pb/Cu-POE) unless an AL is exceeded. However, if a system would like to demonstrate that the existing treatment is optimal, then it must monitor the source water for lead during the two six-month sampling periods in order to make the determination that the difference between the 90th percentile tap level and the source water level is less than the practical quantitation level (PQL). Mathematically, this is represented as follows:

$$90\%TL\text{-}POE < PQL$$

where 90%TL is the 90th percentile lead level; POE is the source water lead level; and PQL is the appropriate practical quantitation level for lead (0.005 mg/l).

B. Medium and Small PWSs. Initial monitoring consists of a first six-month monitoring period during which PWSs sample consumers' taps for lead and copper (Pb/Cu-TAP). If an AL is exceeded at this point, then water quality parameter monitoring of the distribution system and points of entry as well as source water (points of entry) lead and copper monitoring must be completed prior to the conclusion of the first six-month sampling period. Medium and small PWSs exceeding an AL in the first six-month period progress immediately to the determination and recommendation of treatment, and need not complete a second six-month monitoring event.

If a medium or small PWS meets the ALs in the first six-month monitoring period, then a second six-month monitoring event of lead and copper tap samples must be performed. If the system still meets the ALs, then they may proceed immediately to reduced monitoring. Otherwise, the system must complete the water quality parameter monitoring within the distribution system and at the points of entry to the distribution system as well as source water (points of entry) lead and copper monitoring prior to the end of the second six-month monitoring period. Those medium and small PWSs exceeding an AL in the second monitoring period are required to proceed with the determination and recommendation of optimal treatment, only the timeframe for these steps is six months later than for those systems which exceeded the ALs in the first six-month monitoring period.

C. Source Water Monitoring is required for all PWSs when either the lead or copper AL is exceeded in the initial monitoring. If elevated levels of lead or copper are found in the source water, the PWS must recommend source water treatment to the State for approval.

- Follow-up Monitoring consists of two consecutive six-month monitoring periods of comprehensive monitoring

including (1) lead and copper tap samples, (2) distribution system water quality parameter monitoring, and (3) point of entry monitoring for those water quality parameters which define 'optimal' treatment. If the ALs are met by medium or small PWSs during follow-up monitoring, then no additional monitoring for water quality parameters is required in that monitoring period. If the ALs are met by medium or small PWSs during both six-month monitoring periods, States will not need to specify water quality parameter ranges and systems will not need to monitor for WQPs. If either action level is exceeded in either monitoring period, the State will specify, after follow-up monitoring is completed, the water quality parameter ranges which PWSs will be required to meet during subsequent monitoring events.

- Routine Monitoring is performed following the State's specification of the water quality parameter ranges required for the PWS. Large systems must continue to monitor every six-months, collecting Pb/Cu-TAP, WQP-DIS, and WQP-POE samples until the State allows the system to perform reduced monitoring. Only those medium and small systems which exceeded an action level in the follow-up monitoring would be required to perform routine monitoring. If the ALs are met by medium or small PWSs during routine monitoring, then no additional monitoring for water quality parameters is required; otherwise, medium and small PWSs must collect Pb/Cu-TAP, WQP-DIS, and WQP-POE samples every six-months until the State permits the system to perform reduced monitoring.
- Reduced Monitoring refers to the scale-back of both the number of samples and the frequency of monitoring events. States may reduce the lead and copper tap monitoring requirements to an annual event when optimal corrosion control treatment has been demonstrated and its operation maintained by any PWS for two consecutive six-month monitoring periods. Under reduced monitoring, lead and copper tap monitoring must be conducted during the months of June, July, August or September. If the State-specified WQP ranges are exceeded during reduced monitoring, then the system must conduct routine monitoring until the system meets the condition for reduced monitoring.

  For those medium and small PWSs where lead and copper ALs are met during any monitoring period, water quality parameter monitoring is not required during that monitoring period. For these systems, the number of lead and copper tap samples and the monitoring frequency are reduced. State approval to reduce monitoring is not necessary because the ALs were met. Under reduced monitoring, lead and copper tap monitoring must be conducted during the months of June, July, August or September. If the ALs are exceeded in the reduced monitoring, then the system must resume water quality parameter monitoring and complete

the appropriate treatment technique requirements.

- Ultimate Reduced Monitoring comprises further frequency reductions, which reduce lead and copper tap monitoring to once every three years. States may reduce the lead and copper tap monitoring to this frequency after PWSs have operated in compliance with the State-specified WQPs for three consecutive years of reduced monitoring. The frequency of WQP sampling at taps in the distribution system is also reduced under ultimate reduced monitoring. Under ultimate reduced monitoring, lead and copper tap monitoring must be conducted during the months of June, July, August or September. The water quality parameters monitoring at taps in the distribution system must be conducted evenly throughout the year to reflect seasonal variability. If the State-specified WQP ranges are exceeded during ultimate reduced monitoring, then the system must conduct routine monitoring until the system meets the conditions for reduced monitoring.

  For those medium and small PWSs where lead and copper ALs are met during any monitoring period, water quality parameter monitoring is not required during that monitoring period. For these systems, the number of lead and copper tap samples and the monitoring frequency are reduced. State approval to reduce monitoring is not necessary because the ALs were met. Under reduced monitoring, lead and copper tap monitoring must be conducted during the months of June, July, August or September. If the ALs are exceeded in the reduced monitoring, then the system must resume water quality parameter monitoring and complete the appropriate treatment technique requirements.

EPA has designated three groups of parameters for analysis in the monitoring program: (1) lead and copper (Pb/Cu-TAP and Pb/Cu-POE), (2) water quality parameters in the distribution system (WQP-DIS), and (3) water quality parameters at entry points to the distribution system (WQP-POE) for PWSs required to install optimal treatment. The water quality parameters for the distribution system monitoring are: pH, alkalinity, calcium, orthophosphate (when phosphate inhibitors are used), and silica (when silica-based inhibitors are used). Conductivity and water temperature are only required for the initial monitoring. All of these water quality parameters are also required to be monitored at the entry points to the distribution system during the initial monitoring. After installation of the corrosion control treatment, the water quality parameters monitored at the points of entry to the distribution system may include pH, alkalinity, calcium, and the appropriate inhibitor constituent, if applied.

The frequency of analyses and the locations of the sampling sites differ between the lead and copper samples and the water quality parameter samples. The lead and copper samples are to be collected at the targeted sites identified in the utility sampling plan. Water quality parameter samples are to be collected at locations representative of

distribution system water quality conditions and all entry points to the distribution system representative of each source of supply.

A detailed discussion of the monitoring program required by the Rule, including the requirements for a materials survey and a sampling plan, is given in Chapters 3 and 4.

2.1.3 — Corrosion Studies

Corrosion studies are required for all large PWSs (serving more than 50,000 people), and any other PWS exceeding the lead and copper ALs, if required by the State. The results of the corrosion studies are to be submitted to the State with the recommended optimal treatment and its associated water quality parameters. The State will either approve the recommended treatment or designate an alternative treatment which it considers to be more appropriate.

The purpose of corrosion studies is to identify a treatment approach and its attendant operating parameters that will produce optimal corrosion control treatment. This may be accomplished by varying degrees of study, depending on the historical information available to the system and the degree of complexity in providing corrosion control treatment. Among the available means of conducting a corrosion study are (1) literature surveys, (2) bench-scale development of chemical feed rates for specific water quality goals, and (3) static or flow-through corrosion testing to determine the relative performance of alternative treatment approaches in minimizing lead and copper dissolution rates.

A more comprehensive discussion of corrosion control treatment, corrosion studies, and full-scale implementation of treatment technologies is presented in Volume II.

2.1.4 — Lead Service Line Replacement

Lead service line (LSL) replacement is required for those systems which have LSLs present and which continue to exceed the lead AL after the installation and operation of corrosion control and/or source water treatment. If required, PWSs must annually replace at least 7% of the total number of LSLs in the distribution system. The replacement of lead goosenecks and/or pigtails is not required unless they are connected to a LSL. However, if the concentration of lead in a one-liter LSL sample is less than or equal to 0.015 mg/L after treatment has been installed, the LSL at that site would not have to be replaced, but could be counted towards the 7% replacement requirement. LSL replacement may be ceased for those PWSs meeting the lead AL in tap samples collected during two consecutive periods. Should subsequent six-month monitoring period results exceed the lead AL, the LSL replacement program would be required to recommence.

2.1.5 — Public Education

All PWSs that cannot meet the lead AL will be required to implement a public education program. EPA has developed camera-ready print materials and model public service announcements which must

be included in all materials either printed or distributed through the electronic media by the utility. Copies will be included in Volume II. Within 60 days of failing to meet the lead AL, the PWS must deliver these mandatory materials to each user of the system. In addition, as long as the PWS continues to exceed the lead AL, repeat deliveries are required once a year (every 12 months) via inserts to water bills and submission of the printed text to the editorial department of the major daily and weekly newspapers within the community. The required public service announcements which are delivered through radio and television must be repeated every six months.

2.1.6 — Reporting, Compliance Determination, and Public Notification

All monitoring results and determinations of compliance, must be reported to the States by all PWSs. Forms 141-A and 141-B have been prepared to assist PWSs in reporting the necessary information to the States in a timely manner. Examples of these forms are presented in Appendix A. Lead and copper monitoring results from targeted sample sites must be reported within 10-days following the end of each monitoring period. It should be noted, however, that monitoring should be completed much earlier than the end of the monitoring period so that PWSs will have sufficient opportunity to meet the reporting deadline. In addition, the materials survey, sampling plan report, results of any corrosion evaluation studies, and source water treatment and monitoring results must be submitted to the State. Standard public notification language is provided in the rule and these notifications must be distributed when a violation occurs.

2.1.7 — Exemptions

Exemptions may be granted to systems needing additional time for installation of the necessary treatment provided that no Unreasonable Risk to Health (URTH) is imposed on the consumers in the interim and the system meets the conditions specified in section 1416 of the SDWA.

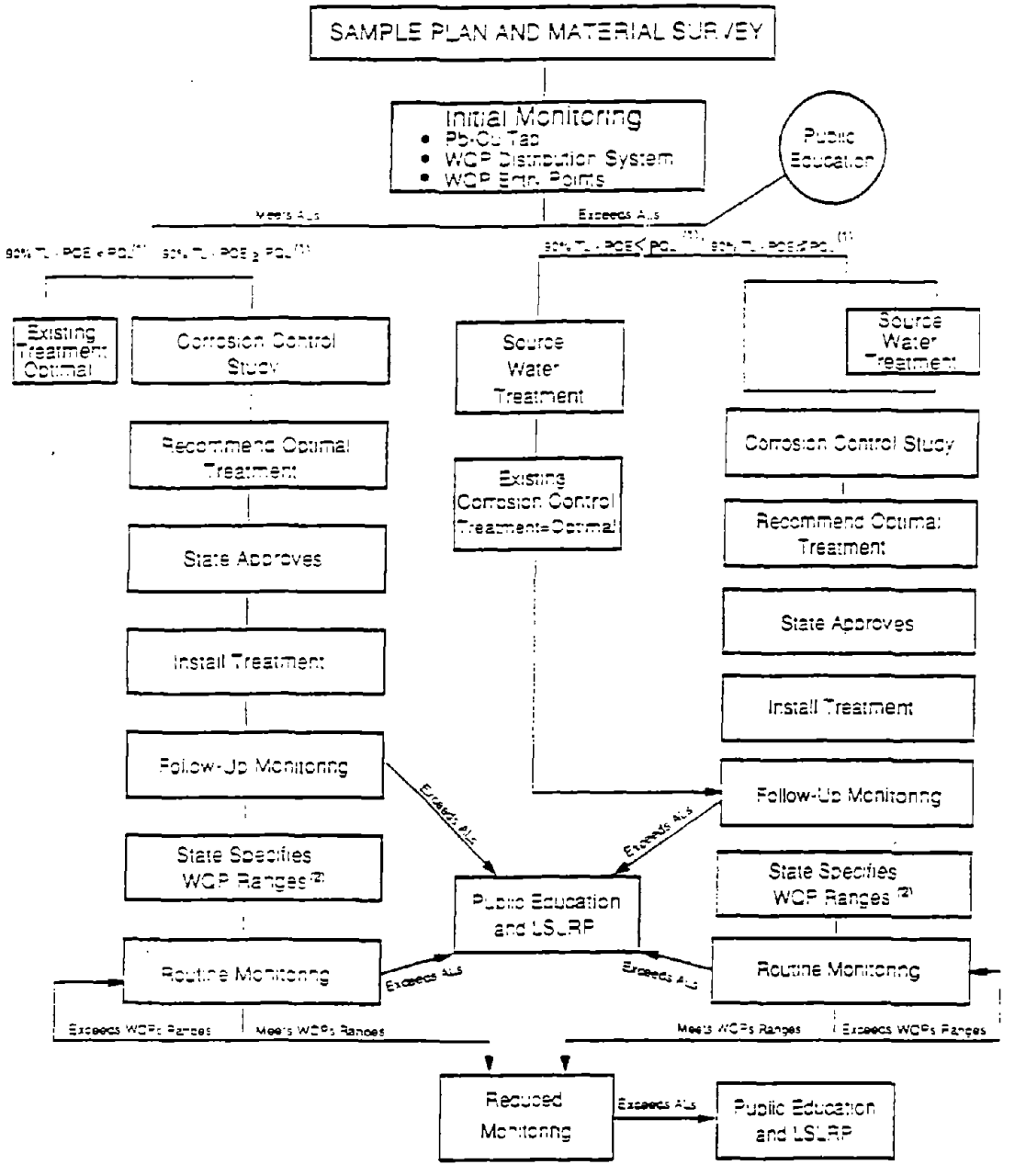
2.2 — Implementation of the Lead and Copper Rule

The requirements of the lead and copper rule are specific to two categories of PWSs: large community water systems serving more than 50,000 people and a second group covering all other PWSs. The second group includes small PWSs (≤ 3,300 people), medium PWSs (3,301 — 50,000 people), and Non-Transient Non-Community Water Systems (NTNCWSs). A brief description of the steps required for each of these system types is presented below along with the timeframe for completion.

2.2.1 — Large Public Water Systems (> 50,000)

Figure 2-3 illustrates the implementation pathway for the Lead and Copper Rule. This figure follows the implementation requirements through to reduced monitoring. Large systems that exceed

Figure 2-3. Implementation Pathway for Large PWSs



(1) The 90th % tap water level (TL...) is the highest source water concentration (Point of Entry) ... the practical quantitative level (PQL).

(2) Water Quality Parameter = WQP

their State-specified WQP ranges during a reduced monitoring event should see the discussion of reduced or ultimate reduced monitoring in Section 2.1.2 of this document. Large PWSs must develop a sampling plan (including performing a materials survey), perform initial monitoring (includes lead/copper at consumers' taps, water quality parameters at entry points to the distribution system and locations throughout the distribution system) and conduct corrosion studies prior to submitting recommendations to the State regarding optimal treatment and the operating conditions which define it. Systems which are required by the State to install source water treatment may also wish to evaluate the possible effects of such treatment on water corrosivity at this time. Further, the results of the initial monitoring events will be used to determine whether a public education program must be initiated.

All large PWSs must perform a study to identify optimal corrosion control treatment. Monitoring data, results, and recommendations based on the corrosion testing performed by the PWS are to be submitted to the States. States will either approve the recommended treatment or designate an alternative optimal treatment. Minimum requirements for pH and/or inhibitor residual levels will have to be achieved in the distribution system, and must be considered in the designation of the optimal treatment conditions.

Once the approved treatment is installed, a second series of monitoring—called follow-up monitoring—is to be performed by large PWSs. Follow-up monitoring consists of two consecutive six-month periods during which (1) consumers' taps are sampled for lead and copper, (2) water quality parameters are measured in the distribution system, and (3) water quality parameters are monitored at the entry points to the distribution system. The results are submitted to the State for review and designation of the water quality parameter ranges defining optimal treatment. Once these ranges have been established, PWSs must then perform routine monitoring to verify the ability of the installed treatment to meet the State-specified ranges (same requirements as the follow-up monitoring only it may extend beyond two consecutive six-month periods). For those systems that meet the State-specified WQPs for two consecutive six-month periods, the State can reduce the monitoring requirements (reduced monitoring).

If a system does not meet the lead and copper ALs in its follow-up sampling (monitoring which is conducted after installation of corrosion control and/or source water treatment), the PWS must continue to collect tap samples for lead and copper, initiate/continue public education, and begin a lead service line replacement program if there are LSLs within the distribution system. Those systems that continue to exceed the ALs during routine monitoring and reduced monitoring are required to continue public education and the LSLRP (if applicable → the system has LSLs).

Table 2-1 presents the timeframe for large PWSs to comply with the corrosion control requirements of the Lead and

Table 2-1. Timeframe for Large PWS Corrosion Control Submissions to the State

PWS ACTION	DEADLINE	SUBMISSION TO STATE
Justification for Insufficient Number of LSL Sites and or Expans on to Tier II or Tier III Sites in Sample Plan	Jan. 1, 1992	LSL Site and/or Targeting Criteria Sections of Form 141-A.
First Six-Month Initial Monitoring Period Results	July 1, 1992	Form 141-A and Monitoring Results: Pb,Cu-TAP; WQP-DIS; WQP-POE Pb,Cu-POE submitted. *
Second Six-Month Initial Monitoring Period Results	Jan. 1, 1993	Form 141-A and Monitoring Results: Pb,Cu-TAP; WQP-DIS; WQP-POE Pb,Cu-POE submitted. *
Corrosion Study and Treatment Recommendations	July 1, 1994	Treatment study report and results as discussed in Volume II.
Certification that the State designated treatment has been installed	Jan. 1, 1997	Letter of Certification
First Six-Month Follow-Up Monitoring Period Results	July 1, 1997	Form 141-A and Monitoring Results Pb,Cu-TAP; WQP-DIS; WQP-POE submitted.
Second Six-Month Follow-Up Monitoring Period Results	Jan. 1, 1998	Form 141-A and Monitoring Results: Pb,Cu-TAP; WQP-DIS; WQP-POE submitted.
State Specifies Optimal Water Quality Parameters	*July 1, 1998*	*Based on Follow-up Monitoring results.*
First Six-Month Monitoring Period after State Specifies Optimal Water Quality Parameters-Routine Monitoring	Jan. 11, 1999	Form 141-A and Monitoring Results: Pb,Cu-TAP; WQP-DIS; WQP-POE submitted.
Second Six-Month Monitoring Period after State Specifies Optimal Quality Parameters-Routine Monitoring	July 11, 1999	Form 141-A and Monitoring Results: Pb/Cu-TAP; WQP-DIS; WQP-POE submitted. Form 141-B when state-specified WQPs have been maintained for two consecutive six-month monitoring periods.
Reduced Monitoring	See Appendix A for Dates	Form 141-A and Monitoring Results: Pb,Cu-TAP; WQP-DIS; WQP-POE submitted. Form 141-B when state-specified WQPs have been maintained for three consecutive years.
Ultimate Reduced Monitoring	See Appendix A for Dates	Form 141-A and Monitoring Results: Pb,Cu-TAP; WQP-DIS; WQP-POE submitted.

* Pb,Cu-POE samples are not required unless the action level is exceeded. However, large system that wish to demonstrate optimization based upon the 90th percentile tap results and the entry point results must sample concurrently with the targeted tap monitoring. System that do not wish to demonstrate corrosion control optimization using this mechanism should follow the source water monitoring requirements in Appendix A

Copper Rule. Further details regarding the treatment requirements is provided in Volume II of this Manual.

2.2.2 — Public Water Systems Serving 50,000 or Less

Figure 2-4 illustrates the implementation pathway for PWSs serving 50,000 people or less. This figure follows the implementation requirements through to reduced monitoring. Medium and small PWSs that exceed their applicable standards (WQP ranges or ALs) in a reduced monitoring event should see the discussion of reduced monitoring or ultimate reduced monitoring in Section 2.1.2 of this document. As with large PWSs, systems must develop a sampling plan (including performing a materials survey) and conduct initial monitoring.

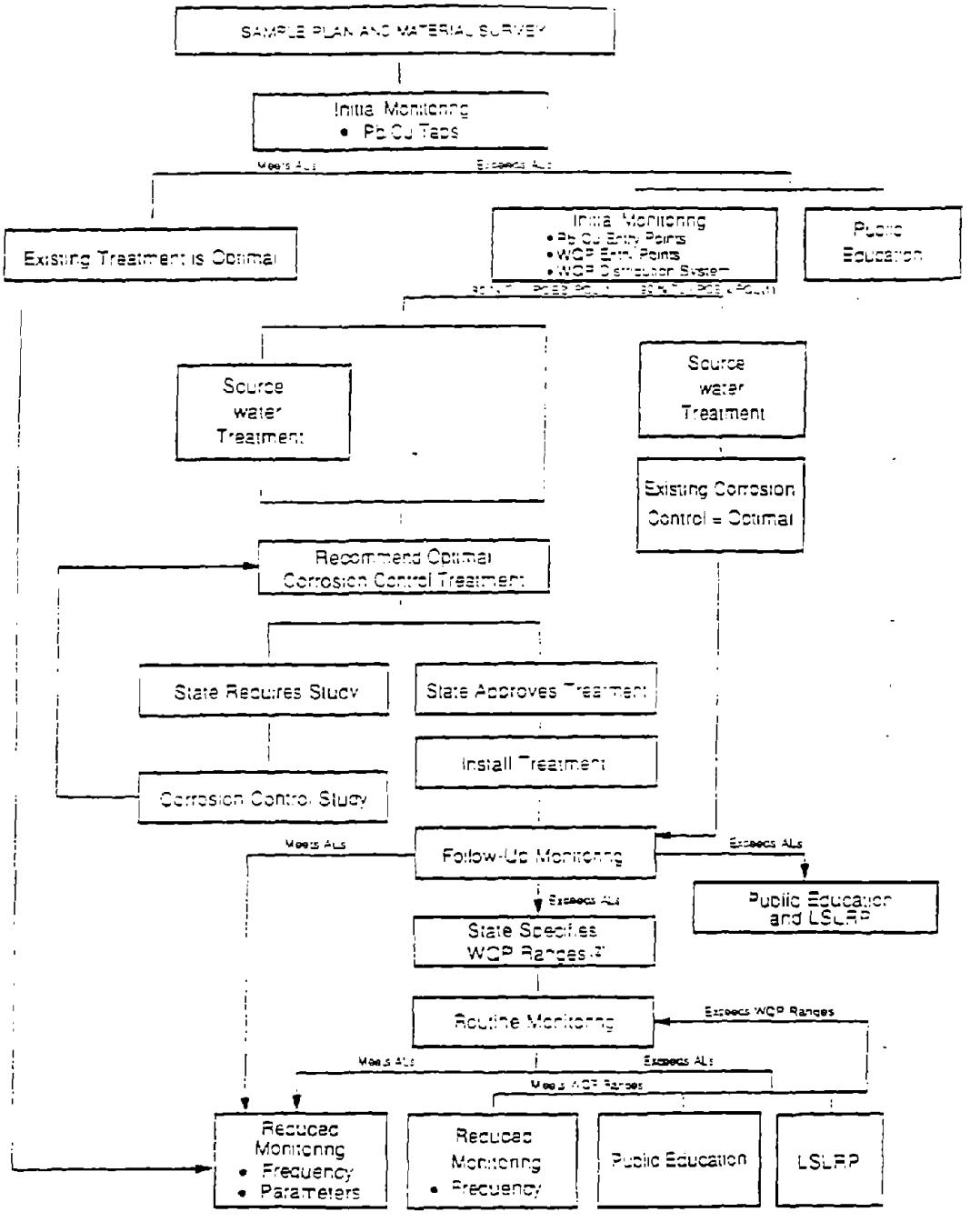
For systems which meet the lead and copper ALs in two consecutive six-month monitoring periods, the State may reduce their monitoring frequency to annually.

The current treatment configuration of the small and medium PWSs will be considered optimal corrosion control treatment if it meets the lead and copper ALs in its initial monitoring step. If the ALs are exceeded, source water monitoring for lead, copper and water quality parameters as well as distribution system monitoring of water quality parameters must be performed. Additionally, public education programs must be initiated. In order to accommodate the monitoring requirements, it is recommended that the lead and copper tap sampling be completed early enough in the monitoring period to allow the subsequent sampling to be conducted prior to the end of the six-month monitoring period.

The State will require the system to submit recommendations on the optimal corrosion control and source water treatment approaches. States may require small or medium PWS that have exceeded an AL to perform corrosion studies in order to support the determination of optimal treatment. Based on the findings of the study, recommended treatment is to be submitted to the State. States have the flexibility to either approve the recommended treatment or designate an alternative treatment for the system, regardless of whether or not corrosion control studies have been performed.

Once the approved treatment is installed, a second series of monitoring—called follow-up monitoring—is to be performed by those medium and small systems that exceeded an action level in the initial monitoring. Follow-up monitoring consists of two consecutive six-month periods during which (1) consumers' taps are sampled for lead and copper and if one of the ALs is exceeded, (2) water quality parameters measured in the distribution system, and (3) water quality parameters are monitored at the entry points to the distribution system. Medium and small systems that exceed an AL in follow-up or routine monitoring are required to monitor for water quality parameters during the monitoring period. Since the WQP-POE monitoring is required bi-weekly during a monitoring period in which an action level is exceeded, these systems should

Figure 2-4. Implementation Pathway for Medium-Size and Small PWSs



(1) The 90th % tap water level (TL) minus the highest source water concentration. Point of Entry is < or ≥ the practical quantitative level (PQL). A second round of Pb/Cu Tap and Pb/Cu POE would be required for this comparison.

(2) Water Quality Parameter = WQP.

conduct WQP-POE monitoring until they determine that an action level will not be exceeded. Since two rounds of WQP-DIS monitoring must also be completed before the end of a six-month monitoring period in which an action level is exceeded, medium and small systems should consider conducting the WQP-DIS monitoring concurrently with the targeted tap monitoring. This may be especially critical when the tap monitoring is conducted toward the end of the six-month period.

If the lead and copper ALs are met during the follow-up monitoring, the system may reduce the monitoring frequency. If the system exceeds an AL during follow-up monitoring, the State designates the water quality parameter ranges defining optimal treatment. Once the WQP ranges have been established, PWSs must then perform routine monitoring (same requirements as the follow-up monitoring only it may extend beyond two consecutive six-month periods) to verify the ability of the installed treatment to meet the State-specified ranges.

Systems which continue to exceed the ALs but which meet the State-specified water quality parameter ranges for two consecutive six-month periods may be allowed to reduce monitoring frequency, while continuing to monitor all water quality parameters and lead and copper at consumers' taps. Additionally, systems which exceed the lead AL must conduct a public education program, and begin a lead service line replacement program if there are LSLs within the distribution system.

Tables 2-2 and 2-3 present the timeframe for medium and small size PWSs, respectively, to comply with the requirements of the Lead and Copper Rule.

2.2.3 — Consecutive Systems

Special difficulties may arise with the implementation of the Rule's requirements for consecutive systems - PWSs which either sell treated water to communities responsible for its distribution; or, PWSs comprised of multiple communities supplied treated water, such as Rural Water Districts or many private water suppliers.

Practical considerations regarding the ability to treat the water supply for corrosion control must be taken into account in the selection of the optimal corrosion control treatment, if required. Wholesalers may be required to undertake the responsibility of treatment, while those communities purchasing the treated water would be responsible for the monitoring activities and delivery of public education where necessary. In addition, communities purchasing the treated water would also be responsible for LSLs in their distribution system.

Problems may arise when ALs are exceeded in some purchasing communities but not in others. Remote treatment for stabilization may be necessary to ensure adequate corrosion control protection throughout the entire wholesaler-purchaser distribution system network. As such, issues confronting such PWSs may involve (1) control over treatment selection by the wholesaler; (2) control over remote treatment stations;

Table 2-2. Timeframe for Medium-Size PWS Corrosion Control Submission to the State*

PWS ACTION	DEADLINE	SUBMISSION TO STATE
Justification for Insufficient Number of LSL Sites and or Expans on to Tier II or Tier III Sites in Sample Plan	July 1, 1992	LSL Site and/or Targeting Criteria Sections of Form 141-A
First Six-Month Initial Monitoring Period Results **		Form 141-A and Monitoring Results
• Exceed ALs	Jan. 1*, 1993	Pb Cu-TAP; WQP-DIS; WQP-POE Pb Cu-POE
• Meet ALs	Jan. 11, 1993	Pb Cu-Tap
Treatment Recommendation	July 1, 1993	Treatment recommendations for corrosion control and or source water treatment
State Requires Corrosion Studies	*Jan. 1, 1994*	*As necessary State notifies PWSs required to perform corrosion studies*
Corros on Study and Treatment Recommendation (if Required by State)	July 1, 1995	Treatment Study Report and Results as D scussed n Volume I
Certification that the State designated treatment has been installed		
Without Study	July 1, 1996	Letter of Certification
With Study	Jan. 1, 1998	Letter of Certification
First Six-Month Follow-Up Monitoring Period Results ***		Form 141-A and Monitoring Results
Without Study	Jan 11, 1997	Pb/Cu-TAP; WQP-DIS; WQP-POE
With Study	July 11, 1998	Pb/Cu-TAP; WQP-DIS; WQP-POE
Second Six-Month Follow-Up Monitoring Period Results		Form 141-A and Monitoring Results.
Without Study	July 11, 1997	Pb/Cu-TAP; WQP-DIS WQP-POE
With Study	Jan. 11, 1999	Pb Cu-TAP; WQP-DIS; WQP-POE
State Specifies Optimal Water Quality Parameters		*Based on Follow-Up Monitoring Results*
without Study	*Jan. 1, 1998*	
with Study	*July 1, 1999*	
First Six-Month Monitoring Period Results after State Specifies Optimal WQP - Routine Monitoring		Form 141-A and Monitoring Results
without Study	July 11, 1998	Pb/Cu-TAP; WQP-DIS WQP-POE
with Study	Jan. 11, 2000	Pb/Cu-TAP; WQP-DIS; WQP-POE

Table 2-2. Timeframe for Medium-Size PWS Corrosion Control Submission to the State* (Continued)

PWS ACTION	DEADLINE	SUBMISSION TO STATE
Second Six-Month Monitoring Period Results after State Specifies Optimal WQP - Routine Monitoring		Form 141-A and Monitoring Results:
without Study	Jan. 11, 1999	Pb/Cu-TAP; WQP-DIS; WQP-POE
with Study	July 11, 2000	Pb/Cu-TAP; WQP-DIS, WQP-POE Form 141-B when state specified WQPs have been maintained for two consecutive six-month monitoring periods
Reduced Monitoring	See Appendix A for Dates	Form 141-A and Monitoring Results: Pb/Cu-TAP; WQP-DIS; WQP-POE Form 141-B when state specified WQPs maintained for Three Consecutive years under reduced monitoring
Ultimate Reduced Monitoring	See Appendix A for Dates	Form 141-A and Monitoring Results Pb/Cu-TAP; WQP-DIS; WQP-POE

* Specifically for those small PWSs which exceed the Als and are required to implement corrosion control treatment and must meet state specified WQPs.

If a small PWS does not exceed the ALs in the two consecutive monitoring periods, then they may request reduced monitoring (Form 141-B) when submitting results of the second six month monitoring period. Those systems that meet the ALs are only required to submit form 141-A and Pb/Cu - Tap monitoring results under reduced monitoring.

** PWSs that meet the Als in the first six-month round of initial monitoring and and fail in the second six-month monitoring period would submit form 141-A with Pb/Cu-TAP results on January 11, 1993. and submit form 141-A with Pb/Cu-TAP, WQP-DIS WQP-POE, Pb/Cu-POE results on July 11, 1993. All other deadlines shown in Table 2-2 should be delayed by six-months.

*** PWSs that meet the ALs in the first six-month period and fail to meet the Als in second six-month period of the follow-up monitoring only need to submit Pb/Cu-TAP results for the first six-month period of follow-up monitoring.

Table 2-3. Timeframe for Small PWS Corrosion Control Submission to the State*

PWS ACTION	DEADLINE	SUBMISSION TO STATE
Justification for Insufficient Number of LSL Sites and or Expansion to Tier II or Tier III Sites in Sample Plan	July 1, 1993	LSL Site and/or Targeting Criteria Sections of Form 141-A
First Six-Month Initial Monitoring Period Results **		Form 141-A and Monitoring Results:
• Exceed ALs	Jan. 11, 1994	Pb/Cu-TAP; WQP-DIS; WQP-POE Pb Cu-POE
• Meet ALs	Jan. 11, 1994	Pb/Cu-TAP
Treatment Recommendation	July 1, 1994	Treatment recommendations for corrosion control and/or source water treatment
State Requires Corrosion Studies	*Jan. 1, 1995*	*As necessary. State notifies PWSs required to perform corrosion studies*
Corrosion Study and Treatment Recommendation (if Required by State)	July 1, 1996	Treatment Study Report and Results as discussed in Volume II
Certification that the State designated treatment has been installed		
Without Study	Jan. 1, 1998	Letter of Certification
With Study	Jan. 1, 1999	Letter of Certification
First Six-Month Follow-Up Monitoring Period Results ***		Form 141-A and Monitoring Results:
Without Study	July 11, 1998	Pb Cu-TAP; WQP-DIS; WQP-POE
With Study	July 11, 1999	Pb Cu-POE may also be Submitted
Second Six-Month Follow-Up Monitoring Period Results		Form 141-A and Monitoring Results:
Without Study	Jan. 11, 1999	Pb Cu-TAP; WQP-DIS; WQP-POE
With Study	Jan. 11, 2000	Pb Cu-Tap; WQP-DIS; WQP-POE
State Specifies Optimal Water Quality Parameters		*Based on Follow-Up Monitoring Results*
without Study	*July 1, 1999*	
with Study	*July 1, 2000*	
First Six-Month Monitoring Period Results after State Specifies Optimal WQP-Routine Monitoring		Form 141-A and Monitoring Results:
without Study	Jan. 11, 2000	Pb/Cu-TAP; WQP-DIS; WQP-POE
with Study	Jan. 11, 2001	Pb Cu-TAP; WQP-DIS; WQP-POE

Table 2-3. Timeframe for Small PWS Corrosion Control Submission to the State* (Continued)

PWS ACTION	DEADLINE	SUBMISSION TO STATE
Second Six-Month Monitoring Period Results after State Specifies Optimal WQP - Routine Monitoring		Form 141-A and Monitoring Results:
without Study	July 11, 2000	Pb/Cu-TAP; WQP-DIS; WQP-POE
with Study	July 11, 2001	Pb/Cu-TAP; WQP-DIS; WQP-POE Form 141-B when state specified WQPs have been maintained for two consecutive six-month monitoring periods
Reduced Monitoring	See Appendix A for Dates	Form 141-A and Monitoring Results: Pb/Cu-TAP; WQP-DIS; WQP-POE Form 141-B when state specified WQPs maintained for Three Consecutive years under reduced monitoring
Ultimate Reduced Monitoring	See Appendix A for Dates	Form 141-A and Monitoring Results Pb/Cu-TAP; WQP-DIS, WQP-POE

* Specifically for those small PWSs which exceed the ALs and are required to implement corrosion control treatment and must meet state specified WQPs.

If a small PWS does not exceed the ALs in the two consecutive monitoring periods, then they may request reduced monitoring (Form 141-B) when submitting results of the second six month monitoring period. Those systems that meet the ALs are only required to submit form 141-A and Pb/Cu - Tap monitoring results under reduced monitoring.

** PWSs that meet the ALs in the first six-month round of initial monitoring and and fail in the second six-month monitoring period would submit form 141-A with Pb/Cu-TAP results on January 11, 1993, and submit form 141-A with Pb/Cu-TAP, WQP-DIS WQP-POE. Pb/Cu-POE results on July 11, 1993. All other deadlines shown in Table 2-2 should be delayed by six-months.

*** PWSs that meet the ALs in the first six-month period and fail to meet the ALs in second six-month period of the follow-up monitoring only need to submit Pb/Cu-TAP results for the first six-month period of follow-up monitoring.

(3) monitoring responsibilities for water quality parameters in the distribution system and points of entry; and, (4) compliance determination for each of the PWSs involved.

EPA notes that 40 CFR 141.29 allows a State to modify the monitoring requirements imposed by specific regulations when a public water system supplies water to one or more other public water systems if the interconnection of the systems justifies treating them as a single system for monitoring purposes. EPA does not believe that modification by States of the monitoring requirements of this rule, as provided in §141.29, would be appropriate because the primary source of high lead or copper levels at the tap is materials within the distribution system itself. Treating multiple water suppliers as one system would not distinguish between the different systems that may have different amounts of lead or copper materials in the distribution system and thus require different treatment strategies to reduce these levels. This contrasts with other contaminants where the contaminant level is uniform throughout the distribution system. EPA does not envision situations where multiple water systems should be considered as one system for purposes of §141.29 and, therefore strongly discourages States from allowing this modification to the monitoring requirements.

CHAPTER 3.0 — MATERIALS SURVEY AND SAMPLING PLANS

3.1 — General

The purpose of the materials survey is to determine the location and extent of lead and copper materials in the distribution system in order to develop an appropriate sampling plan. It is the first major step in implementing the Lead and Copper Rule. Sampling plans must be developed by PWSs in order to begin initial monitoring in a timely manner. Potential sample sites are classified into three tiers. The purpose of these tiers is to ensure that sampling addresses high priority sites. If a PWS cannot meet the Tier I criteria for its sample pool, then justification for inclusion of Tier II and/or for Tier III sites must be provided to the State by the following dates:

System Size	Submit Justification to State
Large	January 1992
Medium	June 1992
Small	June 1993

The results of the materials survey are used to identify "high priority" sites where the potential for exposure to excessive levels of lead and copper exists. High priority locations are defined as those sites that contain either:

(1) copper pipes with lead solder installed after 1982;

(2) lead interior pipes; and/or

(3) lead service lines (LSLs)

The primary "priority risk" sample sites, or targeted sites, are Single Family Residences (SFRs) or certain Non-residential (NRs) locations which contain any of the above-described materials. Non-residential structures are those constructed in similar style and fashion as single-family residences, but used for commercial purposes, such as small insurance agencies, law offices, or boutiques. When referring to SFRs, NRs meeting the specified criteria are implicitly included in the following discussion. Multifamily residences (MFRs), including apartments, may be deemed primary sites when such housing constitutes more than 20 percent of the total service connections in the community.

In cases where an insufficient number of SFR sites exist or are unavailable, PWSs must augment the sampling pool with public buildings (BLDGs) and/or MFRs that contain any of the above-described materials. If a sufficient number of sample sites is still lacking, private residences with lead solder installed prior to 1983 may be included to complete the sample pool. A detailed discussion of the sampling pool criteria is presented in Section 3.5.

Selection of sites should first prioritize locations by their relevant targeting criteria, and then the sites should be as

equally distributed throughout the entire system as practicable. In order to assist PWSs in correlating the tap sampling findings with distribution system water quality behavior, it would be beneficial to have sites well-distributed throughout the system. This may not be feasible due to practical considerations associated with generating a sample pool which meets the specific targeting criteria. PWSs may want to consider, in these cases, selecting distribution system sampling locations representative of those areas where lead and copper tap sampling is to be conducted.

An important step in conducting the materials survey is to identify the location of the various types of buildings serviced by the PWS. Internal records should indicate whether each structure is a domestic residence (SFR), a multi-family residence (MFR) greater than a certain size, or a public or commercial building (BLDG). A review of such records and other information sources available to PWSs will aid in determining the probable plumbing materials used and the year of their installation for a representative sample of sites within the distribution system.

Once the pool of targeted sample sites is identified, this pool is used to develop a monitoring program which provides representative sampling of the these worst-case conditions with regard to lead and copper.

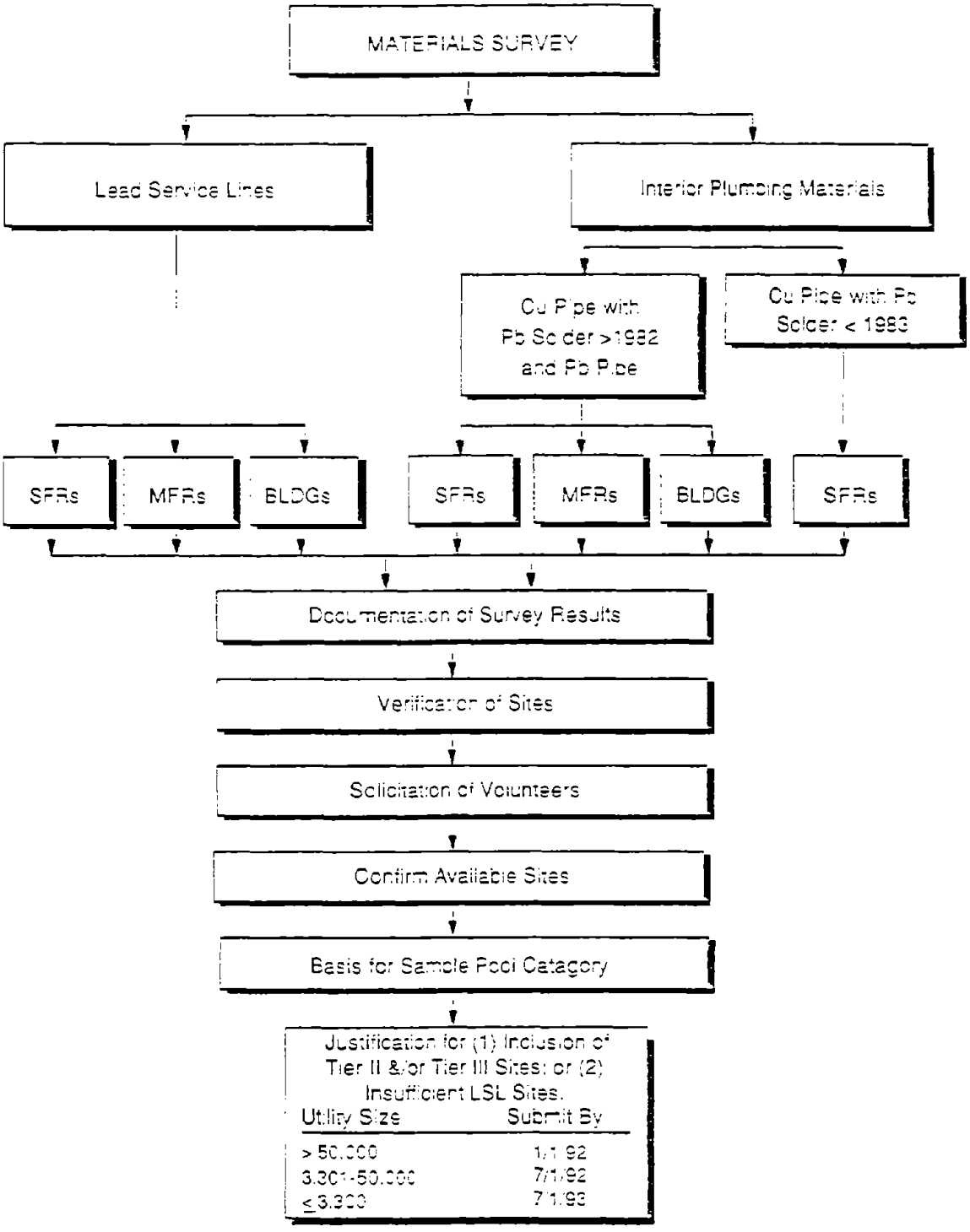
3.2 — Requirements

Systems attempting to characterize the extent of lead occurrence face a complex task. All PWSs must perform a materials survey which is sufficient to appropriately identify the required number of targeted sample sites. Because of the age or lack of mapping and records, some systems may have problems accurately identifying materials in their system. At the very least, the system must review the sources of information as described in Section 3.3. Section 3.3 carefully distinguishes sources of information mandated by the rule from those not mandated. For a more detailed search, its benefits, and suggested organizational formats, refer to Appendix B.

A materials survey systematically attempts to determine the materials used in the construction of the distribution system, service lines and interior plumbing systems served by the utility. The steps for conducting a materials survey are illustrated in Figure 3-1. (It should be noted that Figure 3-1 is a general schematic which does not reflect the tiered requirements of the rule which are discussed in the following paragraph.) Overall, investigations must be performed to identify LSLs within the distribution system and interior plumbing materials, including interior lead pipe and copper plumbing with lead solder.

For each of the material types, a sufficient number of service connections within each target group must be identified and confirmed in terms of (1) site characterization, and (2) willingness to participate. The order of preference for selection of sample sites to be included in the sample site pool are defined by the rule as follows:

Figure 3-1. Materials Survey Pathway



Tier 1:

- SFRs (which includes any NR structures constructed as a SFR structure, and MFRs if they comprise more than 20% of the PWS service connections) with lead soldered copper pipe installed after 1982 or interior lead piping, or SFRs served by a LSL.

Tier 2:

- MFRs or BLDGs with lead soldered copper pipe installed after 1982; or interior lead piping; or serviced by a lead service line.

Tier 3:

- SFRs (which includes any NR structures constructed as a SFR structure) with lead soldered copper pipe installed prior to 1983.

Targeted sites are those sites having copper piping with lead solder installed after 1982. As discussed in the preamble to the final rule, EPA has not required systems to specifically target sites with illegally installed lead solder (i.e., installed after the effective date of the State or local lead ban). However, if a system does locate a site with illegally installed lead solder, such a site would qualify as a Tier 1 sampling site (because it was installed after 1982, as provided in the rule). If one of these sites is sampled during a monitoring period and then found to be in violation of the lead ban, the results must be included for that monitoring period. However, systems are not required by the rule to conduct extensive investigations as to whether buildings built after the effective date of the State or local lead ban contain illegally installed lead solder, since such situations should be rare, and finding them could therefore be time consuming and delay implementation of the rule. Table 3-1 summarizes, by State, the status of the Lead Ban's implementation and its effective date. To initially identify targeted sites, PWSs should identify those SFRs constructed after 1982 and before the effective date of their state's lead ban.

It is the responsibility of the utility to demonstrate to the State that an insufficient number of high priority sites existed or were inaccessible and therefore, the sample pool had to be supplemented with sites of lesser priority. Those systems which supplement with lower priority sites are required to submit their reasons before initial monitoring begins. Additionally, any PWS which has identified LSLs within the distribution system, but cannot fulfill 50% of the required, minimum number of sampling sites with LSL sites, must also submit justification for the use of non-LSL sites to complete the sample pool prior to the beginning of initial monitoring. For example, if a PWS serving more than 100,000 people can only confirm 30 specific SFRs served by LSLs willing to participate in the monitoring program, then this system would have to submit to the State the reasons for not having at least 50 LSL sites. Also, if Tier II or Tier III sites were used to complete the minimum sample pool requirement, justification of the basis for selecting the lower priority sites would also have to be provided to the State prior to January 1992.

Table 3-1. Summary of Lead Ban Provisions by State

EPA Region	State	Implemented Lead Ban	Method	Date Effective	Certification Signature	Requires Solder	Use of Flux	Lead Pipe	Notes
I	Connecticut	Yes	Public Act No 86-192, Sec 29-261 CT General Statues, State Plumbing Code	12/31/88	Governor 03/29/89	X	X	X	Requires solder warning label
	Maine	Yes	Internal Plumbing Rules 10-144A CMR238, Chapter 9,8,10, Chapter 3, Table 3,5, and Chapter III D 1	08/01/87	Commissioner, Dept of Human Services 02/23/89	X	X	X	State purchased Pb solder test kits for inspectors, etc to use in field testing
	Massachusetts	Yes	State Plumbing Code, 248 CMR, Pg 55, 204, 208, 207	01/01/86	Commissioner, Dept of Env Protection 03/08/89	X	X	X	
	New Hampshire	Yes	State Plumbing Code, Chapter 100-800, Part 802.801	08/01/87	Commissioner, Dept of Env Services 03/27/89	X	X	X	Adopted BOCA
	Rhode Island	Yes	Regulation S DC 3; Article 4, P402.3 and P402.4; and Article 5, P508.4 and P509.5	01/01/87	Governor 03/28/89	X	X	X	Adopted BOCA
	Vermont	Yes	VT Residential Plumbing Code, APC Envir Protection Rules for public buildings	12/28/88 09/10/82	Commissioner of Health, 03/27/89	X	X	X	New legislation eff June 1989 consolidating plumbing codes and clarifying lead ban
II	New Jersey	Yes	Uniform Construction Code, Plumbing Subcode 5:23-3.15	02/07/87	Governor 02/02/89	X	X	X	Pipe is covered under Bureau of SDWA Regulations
	New York	Yes	Executive Law, Section 905.5 of Title 9 NYCRR	01/01/86	Commissioner of Health, 01/11/89	X	X	X	Lead ban law Lead labeling law
	Puerto Rico	Yes	Planning Board Regulation #7 (Building Regulation) Article V-8.1.0	06/19/88	Governor	X	X	X	
	Virgin Islands	Yes	VI Interim Primary DW Standards Title 17, VI Rules & Regs, Chapter 51, Section 1303	02/06/89	Governor 02/06/89	X	X	X	
III	Delaware	Yes	State Plumbing Code, Section 119 Chapt 79, Sec 7906, Chapt 1, Sec 122c	06/17/88	Secy Dept Health & Social Services	X	X	X	Adopted BOCA
	D C	Yes	D C Plumbing Code Supplement of 1986, Article 5	08/19/88		X	X		Requires PN, bans >8% pipe, but not fittings
	Maryland	Yes	COMAR 09.20.05.02, 09.20.11.10E, 09.01.02.09.01.03	08/16/88	Secy Environment 09/15/88	X	X	X	Effective 03/30/89 for pipes and fittings
	Pennsylvania	No	Plumbing System Lead Ban and Notification Act of 7/69	01/06/91		X	X	X	Act also bans the sale of materials that are not lead free

Table 3-1. Summary of Lead Ban Provisions by State (Continued)

EPA Region	State	Implemented Lead Ban	Method	Date Effective	Certification Signature	Requires Solder	Use of Flux	Lead Pipe	Notes
	Virginia	Yes	Uniform Statewide Plumbing code P 501 7 3, P 501 8 4 and P-2101.4	04/01/86	Governor	X	X	X	Adopted BOCA 01/15/87
	West Virginia	Yes	Legislative Rules, Dept of Health, Plumbing Requirements 64 CSR 57	06/19/88	Governor	X	X	X	Requires PN
IV	Alabama	Yes	State Lead Ban Act, ADEM Admin Code R 335 7 11 05	05/10/88 01/89	Governor/ADEM Director	X	X	X	
	Florida	Yes	Florida Statues, Subsection 553 11 and 553 06	06/10/88 12/88	Governor/DER Secretary	X	X	X	Dept of Community Affairs to adopt amended State Plumbing Codes
	Georgia	Yes	State Plumbing Code, Section 402 1 Section 1145 and Section 1109.1; State Regs	07/87 01/89		X	X	X	
	Kentucky	Yes	State Plumbing Code, Section 17, PC 60 3	01/04/88	Commissioner of Bd of Housing Mgt D w Branch	X	X	X	Formalization of enforcement procedures with the Div of Plumbing with the next few months (11/90)
	Mississippi	Yes	Board of Health, Const Regs Division 800 Water Supply, Part 801 Section 801 5(c)	01/13/88 05/88	Exec Secy Bd of Health/Asst Dir Div Water Supply	X	X	X	Requires PN
	North Carolina	Yes	State Plumbing Code Volume II, Section 6024 (solder & Flux) Section 1008 (solder, pipe, flux)	01/87	Comm of Insurance/Head Public Water Supply Branch	X	X	X	Requires PN
	South Carolina	Yes	State SDWA, 61-58 4(1)	11/88	Chief Bureau DW Program	X	X	X	Requires PN, State Plumbing Codes expected to be amended during next legislative session
	Tennessee	Yes	Tennessee Code Annotated, Title 68, Chapter 13, Part 1	03/18/88	Governor/Dir Div Water Supply	X	X	X	
V	Illinois	Yes	illinois Administrative Code, Chapter I, Section 890 620bl	04/86	Dir of IL EPA & Dir of Dept of Health, 09/13/88	X	X	X	
	Indiana	Yes	IN Plumbing Code, title 675, Sec 7 Subsec 113g and Sec. 602, Subsec d	03/01/87	NA	X	X	X	
	Michigan	Yes	Mi Construction Code Act	06/07/88	Governor 11/21/88	X	X	X	
	Minnesota	Yes	Minnesota Statues, Chapter 326, Section 326 371, MN Plumbing Code	06/01/85	Comm of Health 09/23/88	X	X	X	Sellers of lead solder must display warning sign
	Ohio	Yes	OH Basic Building Code	09/12/88	OH EPA & Governor 09/26/88	X	X	X	

Table 3-1. Summary of Lead Ban Provisions by State (Continued)

EPA Region	State	Implemented Lead Ban	Method	Date Effective	Certification Signature	Requires Solder	Use of Flux	Lead Pipe	Notes
	Wisconsin	Yes	Wisconsin Administrative Code	1986	Governor 02/28/88	X	X	X	
VI	Arkansas	Yes	State Plumbing Code, 10 I 6 and 10 I 7	06/01/88	Governor Bill Clinton 06/16/88	X	X	X	
	Louisiana	Yes	State Sanitary Code, chapter XII (Water Supplies)	09/20/88	Dept. Asst. Secy of Dept. of Health & Hospitals 09/17/88	X	X	X	Requires PN
	New Mexico	Yes	State Plumbing Regulations	01/01/87	Governor Garrey Carruthers 12/06/88	X	X	X	Requires PN
	Oklahoma	Yes	Rules and Regulations Governing Plumbers	05/06/87	Governor Henry Bellman	X	X	X	Adopted BOCA
	Texas	Yes	Rules and Regulations for Public Water Systems, 337.206(b)	07/01/88	Governor Clements 09/29/88	X	X	X	
VII	Iowa	Yes	IA Administrative Code, Chapters 40 and 41	09/14/88	Larry Wilson Exec. Dir. of IDNR	X	X	X	Requires PN
	Kansas	Yes	KS Statutory Authority 65-1710 and 65-1711R	04/19/88	Dr. Stanley C. Grant Secy. KDHE*	X	X	X	Requires PN
	Missouri	Yes	10CSR 60-10.010 and 60-8.020, and MS Released States, Chapter 311.060	08/31/88	Dr. P. Brunner* Dir. MDNR	X	X	X	Requires PN
			*Since signing, Dr. Brunner has resigned. The new Director is G. Tracy Mehan, III						
	Nebraska	Yes	NE Safe Drinking Water Act, Title 179, Chapter 2, Sections 003, 004, 005	05/88	Greg Wright, Dir. Dept of Health	X	X	X	Requires PN
VIII	Colorado	Yes	CO Plumbing Code, Chapters 8 and 10	01/31/88	Governor 11/21/91	X	X	X	Adopted Uniform Plumbing Code
	Montana	Yes	Administrative Rules, 8.70.104, Plumbing Permits(4)	12/31/87	Chief, Water Quality Bureau, 10/11/88	X	X	X	
	North Dakota	Yes	State Plumbing Code, Sections 62-03-033.1.08(5), 63.03.04.02(4)	01/01/88	Governor 09/19/88	X	X	X	
	South Dakota	yes	State Plumbing Code	09/03/87	Secy. Dept. of Water Resources, 03/15/89	X	X	X	
	Utah	Yes	State Plumbing Code	04/24/89	Dir. Division of Env. Health 07/08/89	X	X	X	
	Wyoming	NO	The Region is trying to implement a lead ban at the local level while pursuing the adoption of a State lead ban						
IX	Arizona	Yes	AZ Revised Statues, 49-353.A2(k) and 49-353.B	08/18/87	Governor 08/28/88	X	X	X	Requires PN, Adopted uniform plumbing code.
	California	Yes	Health and Safety Code, SB164 Sections 3006 and 3007	07/01/86	Gov. George Dankmejian, 01/28/89	X	X	X	Effective 01/01/88 for pipes solder warning label

Table 3-1. Summary of Lead Ban Provisions by State (Continued)

EPA Region	State	Implemented Lead Ban	Method	Date Effective	Certification Signature	Requires Solder	Use of Flux	Lead Pipe	Notes
	Hawaii	Yes	HI Revised Statues, Chapter 340E	06/05/87	Dir. Dept. of Health 03/22/89	X	X	X	Requires PN, fines
	Nevada	Yes	NAC, Chapter 445,412, Revised Statues	01/89	State Health Officer 02/18/89	X	X	X	Requires PN
	American Samoa	Yes	AS D W Regs Sec 25 0131 1	01/89	Yes	X	X	X	
	N. Marianas Is.	Yes	CNMI Drinking Water Regs Section 5 51	01/13/89	Gov. Pedro Tenorio 01/13/89	X	X	X	
	Guam	Yes	Revised Uniform Plumbing Code, 1988	01/01/88	Gov. Joseph P. Ada, 04/07/89	X	X	X	
	Rep. of Palau	No							Trust Territory
X	Alaska	Yes	Section 1, AS 18 60 705	06/05/88	Governor, 04/11/88	X	X	X	Covers all water systems as of 4/89
	Idaho	Yes	Idaho Code Chapter 26, Title 54	08/11/88	Governor, 01/30/89	X	X	X	Adopted Uniform Plumbing Code
	Oregon	Yes	Health Division, Rules 333 61 020, 333 61-040 and 333 61 087	09/04/84	Governor, 01/10/89	X	X	X	Warning labels, removal of lead service lines, public notification lead flux was banned in 1988
	Washington	Yes	State Building code, Chapter 551 16 WAC, Section 15-16 060	01/22/87 03/17/88	Governor, 01/30/89	X	X	X	
	Total Yes No	54 1				56	56	55	

For those systems with Tier I sample pools which either have 50% of the sites comprised of LSLs or do not contain LSLs within the distribution system, a listing of the selected sample sites and their characterization does not need to be provided to the State until the submission of each six-month monitoring period's results.

3.3 — Resources

Historically, various materials have been used in distribution and residential plumbing systems. Several resources may be available for information concerning materials and the extent of their usage in the distribution system. Few PWSs are likely to have extensive records documenting the installation, repair, and/or replacement of distribution system materials, and certainly do not have records regarding the interior plumbing materials used in individual structures within the service area. Therefore, a variety of informational sources may need to be investigated by PWSs to generate reliable data regarding the identification of distribution system and home plumbing materials.

The rule does require a system which cannot meet Tier I sample sites (see Section 3.6) to investigate specific sources of information. The following discussion highlights these required sources along with additional suggested sources that may be utilized.

3.3.1 — Distribution System and Service Line Materials

The goal of the material survey is to identify a sufficiently large pool of targeted sample sites to maintain their minimum number over time, as some sites may become unavailable or cease to meet the targeted criteria. Potential sources of information are listed below. In no cases are PWSs expected to use excavation as a means of identifying LSL locations.

A. Utility Records -- **Required by Rule**. Historical and current records maintained by PWSs can provide excellent information on the materials used in the distribution system for service lines and connections. Some examples include:

1. Information collected on lead and copper as part of the monitoring for corrosivity required under Section 141.42 (d) of the Code of Federal Regulations. This section refers to previous requirements set by the EPA, that all community water suppliers (1) determine corrosivity characteristics by measuring water quality parameters for corrosion indices, and (2) perform a materials survey to identify lead, copper, galvanized iron, and asbestos cement as being present in the system.
2. Distribution Maps and Record Drawings. Maps and drawings of the distribution system should be a primary source for service line and connection information including materials, line sizes, and

dates. Even with a lack of detail such sources may be useful in indicating the historical growth of the system. The maps would also provide a visual aid in developing the materials survey. Such maps would also be useful for monitoring data submissions as suggested in Appendix B.

3. Maintenance Records. Maintenance records often identify such information as (1) existing materials; (2) replacement materials; (3) date of event; and (4) particular site conditions of note. LSLs may be specifically identified when encountered during maintenance activities.

4. Historical Documentation. Every utility has its own unique system of collecting and filing information. This documentation should be investigated to determine (1) the progressive growth of the distribution system; (2) dates and materials used for installation and replacement of distribution system components; and, (3) the construction practices throughout the development of the PWS service area.

5. Meter Installation Records. Meter installation records could provide information on service line materials and indicate the type and age of construction. Meter size is also an important element as it may be used as the basis for differentiating among structure types, i.e., SFRs, MFRs, and BLDGs.

6. Existing Water Quality Data. Water quality data obtained from utility and/or regulatory agency records can indicate areas that exhibit high or unusual lead and copper levels. This information could be used to confirm existing information on materials or on areas where records are missing or incomplete. This data may also be useful to support justification claims, if necessary, for sample site selections.

7. Capital Improvements and Master Plans. **Suggested**. Information regarding planned or executed improvements to portions of the distribution system may be provided by existing and/or historical Capital Improvement or Master Plans. In particular, base maps of the system may be available for use in tracking and recording the material survey information.

8. Standard Operating Procedures (SOPs). **Suggested**. SOPs will often list the type of materials to be used during the construction and/or repair of distribution system mains, lines, and connections.

9. Operation & Maintenance Manuals (O&M). **Suggested**. O&M manuals may also indicate the type of materials installed, the method for replacement as well as replacement materials to be used.

B. Permit Files. **Required by Rule.** Whether maintained by the PWS or other municipal agency, permit files

should be reviewed to determine the presence and location of LSLs. Pre-1940 documents are especially important. Recent records should also be reviewed to ascertain service line replacements and/or repairs.

C. Senior Personnel and Retirees. **Suggested.** PWS personnel or other agency staff experienced in the operation, maintenance, or material usages within the distribution system and/or home plumbing environments should be consulted. These personnel will often have first-hand knowledge regarding these matters which can supplement incomplete records or provide basic data when information is otherwise lacking. Additionally, local contractors or developers may have reliable information on the materials of construction for sections of the distribution system.

D. Community Survey -- **Suggested.** A community survey may be helpful in identifying LSL connections. A utility could perform this survey by mail using a standard questionnaire. Many PWSs have indicated a preference for the use of some form of a community survey to assist in identifying potential targeted sampling sites where owners or residents may be predisposed to volunteering their participation. Selective mailings to new billing units identified since 1982 and/or those residents located in sections of town where LSLs are anticipated (perhaps, organized by zip code area) could reduce the total number of surveys to be distributed as well as the effort's associated costs.

E. Other Sources **Suggested.** -- Any other sources that may be available to the utility that might be helpful in identifying the materials used in the system should be investigated. For example, piping suppliers may be able to fill in or confirm material supplied during a specific time period or to a specific development.

Historical USGS maps and aerial photography records may be used to retrace the development of the service area over time. This is very useful in identifying those locations where LSLs are most likely to be found since the use of LSLs in many communities was discontinued after approximately 1940. In some areas, this generalization may not be applicable.

In no cases are PWSs expected to use excavation as a means of identifying LSL locations.

3.3.2 — Interior Plumbing Material

Below is a list of potential resources which could be investigated to determine material used in interior plumbing. The first three sources are required by the rule to be investigated, if an insufficient number of Tier 1 sites are available.

A. Plumbing Codes -- **Required by Rule.** A review of historical and current local plumbing codes should be conducted to identify the array of interior plumbing materials expected within a PWS service area. Plumbing codes are generally available from either the building or public works department of the appropriate govern-

mental body. In cases where there is multi-jurisdictional control within the PWS service area, an investigation of each jurisdiction's code is necessary. It is likely that these sources would have copies of the past codes on file. In selecting potential targeted sites for further investigation, it may be assumed that plumbing materials will conform to the code in effect at the time of construction.

B. Plumbing Permits -- **Required by Rule**. Plumbing permits should show the type of materials used, location of construction, and the date of the permit application. In many municipalities, construction permits for new construction and kitchen/bathroom remodeling are issued through the building department. Tracing the historical permits with the plumbing code provisions should indicate locations where copper plumbing with lead solder is likely to be found. The permits may also indicate those residences that have replaced lead- and/or copper-containing materials with other materials such as plastic.

C. Existing Water Quality Data -- **Required by Rule**. Water quality data for lead and copper levels in home tap samples and service line samples can be used to indicate problem areas. They may also be used to confirm the presence of lead- and copper-containing materials in areas where insufficient information exists. Site visits and verification checks on individual sites should be performed to confirm the site's characterization.

D. Historical Documentation of Service Area Development -- **Suggested**. Based on the review of available information described in Section 3.3.1, the PWS service area may be characterized by the age of various regions. Where detailed information is missing, housing developments within identifiable regions may be assumed to have been constructed using plumbing codes and typical practices of that time.

E. Interviews with Plumbers/Building Inspectors -- **Suggested**. These personnel, particularly senior personnel and retirees, may have first hand knowledge of materials used for original and remodeled homes. This information can be used to supplement incomplete records or provide basic data for systems lacking records. Additionally, local contractors or developers may have reliable information on the materials of construction used in sections of the service area.

F. Community Survey -- **Suggested**. A community survey may be helpful in identifying LSL connections. A utility could perform this survey by mail using a standard questionnaire. Many PWSs have indicated a preference for the use of some form of a community survey to assist in identifying potential targeted sampling sites since these owners or residents may be predisposed to volunteering their participation in later sampling. Selective mailings to new billing units identified since 1982 and/or those residents located in sections of town where LSLs are anticipated (perhaps,

organized by zip code area) could reduce the total number of surveys to be distributed as well as the effort's associated costs.

3.3.3 — Data Collection and Organization

A materials survey generates a significant amount of data which must be collected in an organized fashion, synthesized, and processed to generate the development of a sampling plan for lead and copper. Table 3-2 presents an example of data organization for documenting the results of the materials survey as they become available. Note that the information contained in Table 3-2 represents the minimum required by the Federal rule. It is suggested that additional information on distribution and interior plumbing which may become available during the research phase also be documented and organized for useful consideration. Data handling for more thorough identification and characterization of service area materials can be found in Appendix B.

Table 3-3 is an example of a survey results table. This form is designed to quantify the number of service connections which have the specific service line and interior plumbing characteristics required by the rule.

Table 3-4 is a summary of the materials survey results present in Tables 3-2 and 3-3. This table is designed such that, once the table is completed, PWSs can use it to determine the appropriate Sampling Pool Category for their system (see Figure 3-2 in Section 3.5).

3.4 — Conducting Materials Surveys

To conduct a materials survey, the utility should establish a step-by-step plan to achieve the objective of identifying suitable sampling sites. Table 3-5 provides a sample checklist for PWSs to follow in performing materials surveys. However, the utility should modify this checklist as needed to fit its specific circumstances. A general procedure is discussed below:

1. Using the resources given in Section 3.3, the utility should systematically research and cross-check information between sources. Depending upon the size and extent of the distribution system, the PWS should select a method for documenting the information obtained from the various sources. The methods could include (1) updating information regarding service connection or billing units, (2) labeling detailed distribution system record drawings, (3) listing permits by service areas for new construction and remodeling, and (4) creating large-scale maps of areas with wide use of lead and copper materials or elevated lead and copper levels in tap water.
2. As feasible, residences identified as potentially meeting the targeting criteria established for high priority sites should be physically investigated, especially if records are incomplete or contradictory. It is recommended that initially PWSs serving more than 3,300 people select five times the minimum number of sample

Table 3-2. Results of Material Survey Investigation

PWS FRDS NUMBER

POPULATION SERVED BY PWS

TYPE OF STRUCTURE	LOCATION	CONTACT PERSON		LSL	HOME PLUMBING MATERIAL	VERIFIED	VOLUNTEERED	SELECTED		RECEIVED TRAINING MATERIAL
		NAME	PHONE					ROUTINE	OPTIONAL	
MFH	210 MAIN ST	J. DOE	765 4567	NO	Cu/Pb solder>82	NO	NO		X	NO
SFR	12 ELM ST	M. SMITH	765 5218	YES	N/A	YES	YES	X		YES
INFORMATION IN THIS COLUMN: SFR, MFR OR BLDG	INFORMATION IN THIS COLUMN: ADDRESS, CITY, STATE, AND ZIP CODE	INFORMATION IN THIS COLUMN: SCHEDULING CONTACT PERSON NAME	INFORMATION IN THIS COLUMN: DAYTIME PHONE NUMBER	INFORMATION IN THIS COLUMN: YES OR NO	INFORMATION IN THIS COLUMN: N/A (MATERIAL OTHER THAN Pb OR Cu) Pb - INTERIOR Cu - Pb SOLDER > 1982 Cu - Pb SOLDER < 1983 LSL	INFORMATION IN THIS COLUMN: YES OR NO	INFORMATION IN THIS COLUMN: YES OR NO	INFORMATION IN THIS COLUMN: X IF APPROPRIATE	INFORMATION IN THIS COLUMN: X IF APPROPRIATE	INFORMATION IN THIS COLUMN: YES OR NO

Table 3-3. Materials Survey Results by Number of Service Connections for Each Plumbing Materials Type

PWS ERDS NUMBER

POPULATION SERVED BY PWS

TYPE OF STRUCTURE	TYPE OF PLUMBING MATERIAL				
	INTERIOR PLUMBING			DISTRIBUTION SYSTEM PIPING	
				LSLs	
	LEAD PIPE	COPPER >1982	COPPER <1983	ENTIRE LINE	PARTIAL LINE
	NUMBER OF SERVICE CONNECTIONS			NUMBER OF SERVICE CONNECTIONS	
SFRs					
MFRs					
BLDGs					
TOTAL					

Table 3-4. Summary of Materials Survey Results

PWS FRDS NUMBER

POPULATION SERVED BY PWS

PLUMBING MATERIAL	TYPE OF STRUCTURE		
	SFR	MFR	BLDG
	NUMBER OF SERVICE CONNECTIONS		
INTERIOR PLUMBING			
LEAD PIPE			
COPPER PIPE WITH LEAD SOLDER >1982			
COPPER PIPE WITH LEAD SOLDER <1983			
SERVICE LINES			
LSLs			
ENTIRE LINE			
PARTIAL LINE			
TOTAL AVAILABLE SITES			

Table 3-5. Materials Survey Checklist

Distribution System Materials

The following resources have been explored to determine or estimate the number of lead service lines in the distribution system.

_____ Distribution System Maps and Record Drawings
_____ Information collected for the presence of lead and copper as required under §141.42 of the Code of Federal Regulations (special monitoring requirements for corrosivity)
_____ Capital improvement plans and/or master plans for distribution system development
_____ Current and historical standard operating procedures and/or operation and maintenance (O&M) manuals for the type of materials used to install service connections
_____ Utility records including meter installation records, customer complaint investigations and all historical documentation which indicate and/or confirm the location of lead service connections
_____ Existing water quality data for indications of 'troubled areas'

Other Sources

_____ Interviews with senior personnel
_____ Conduct service line sampling where lead service lines are suspected to exist but their presence is not confirmed
_____ Review permit files
_____ Perform community survey
_____ Review USGS maps and records
_____ Interview pipe suppliers, contractors, and/or developers

Interior Plumbing Materials

The following sources have been explored to determine or estimate the number of structures which have interior lead pipe or copper pipe with lead solder.

_____ Plumbing and/or building codes
_____ Plumbing and/or building permits
_____ Cotnacts within the building department, municipal clerk's office, or State regulatory agencies for historical documentation of the service area development
_____ Review Water Quality Data

Other Resources Which PWS May Utilize

_____ Interviews with building inspectors
_____ Survey of service area plumbers about when and where lead solder was used from 1983 to present
_____ Survey residents in sections of the service area where lead pipe and/or copper pipe with lead solder is suspected to exist
_____ Interview local contractors and developers

sites for inspection or follow-up activities while those serving ≤3,300 people select three times the minimum number of sites. By selecting such a large number of potential sites initially, PWSs can expect to locate at least the minimum number of targeted sites once field verification and confirmation of participation in the monitoring program eliminates the inappropriate and unavailable sites. Further, PWSs should consider the inclusion of more than the minimum number of sample sites in their sample pool to ensure a sufficient number of targeted sites being available throughout the duration of the Lead and Copper Rule implementation timeframe.

Physical inspections could include inspection of the service lines to and from the water meter, identification of the piping materials within the plumbing system and scrapings for lead analysis of solder from the outside of joints or connections. Test kits are available to determine the presence of lead in solder materials. In cases where there appears to be mixed service line materials, the PWS should use their best judgement as to whether the predominant material is lead. Lead and copper concentrations in tap or service line samples may be used to assess the materials present and support the judgement of the PWS in service line identification. Meter readers could be trained to perform these on-site inspections and sample collections, as necessary.

Once a sufficient number of sites having owners' agreements for participation have been secured, additional inspection activities are not required. However, it is recommended that PWSs include an additional one and a half times the minimum number of sample sites for the final sample pool.

3.5 — Sample Plan Development

A sample plan for the collection of lead, copper, and water quality parameter samples must be developed before initial monitoring begins in order to have identified the sample sites and sample pool category applicable to the system.

When reporting the results of the initial monitoring (ten days after every six-month period), PWSs are required to certify that (1) all samples were collected at targeted sites, and (2) property owners were informed of the sample collection procedures. Additionally, PWSs must document the resulting sample pool category and tier (discussed below) for the system as well as each site's location and targeting criteria.

3.5.1 — Targeted Tap Sampling Site Selection

PWSs are required to identify a sufficient number of sampling sites to collect the required number of first-draw tap samples from distinct sites. The following table indicates the minimum number of first-draw tap sample sites which must be included in a utility's sampling plan for lead and copper.

PWS System Size	Minimum Number of Sample Sites	Recommended Number of Sample Sites
>100,000	100	150
10,001—100,000	60	90
3,301—10,000	40	60
501—3,300	20	30
101—500	10	15
≤100	5	7

Note that PWSs must report the results of all samples collected, even if more than the minimum number of sites were monitored.

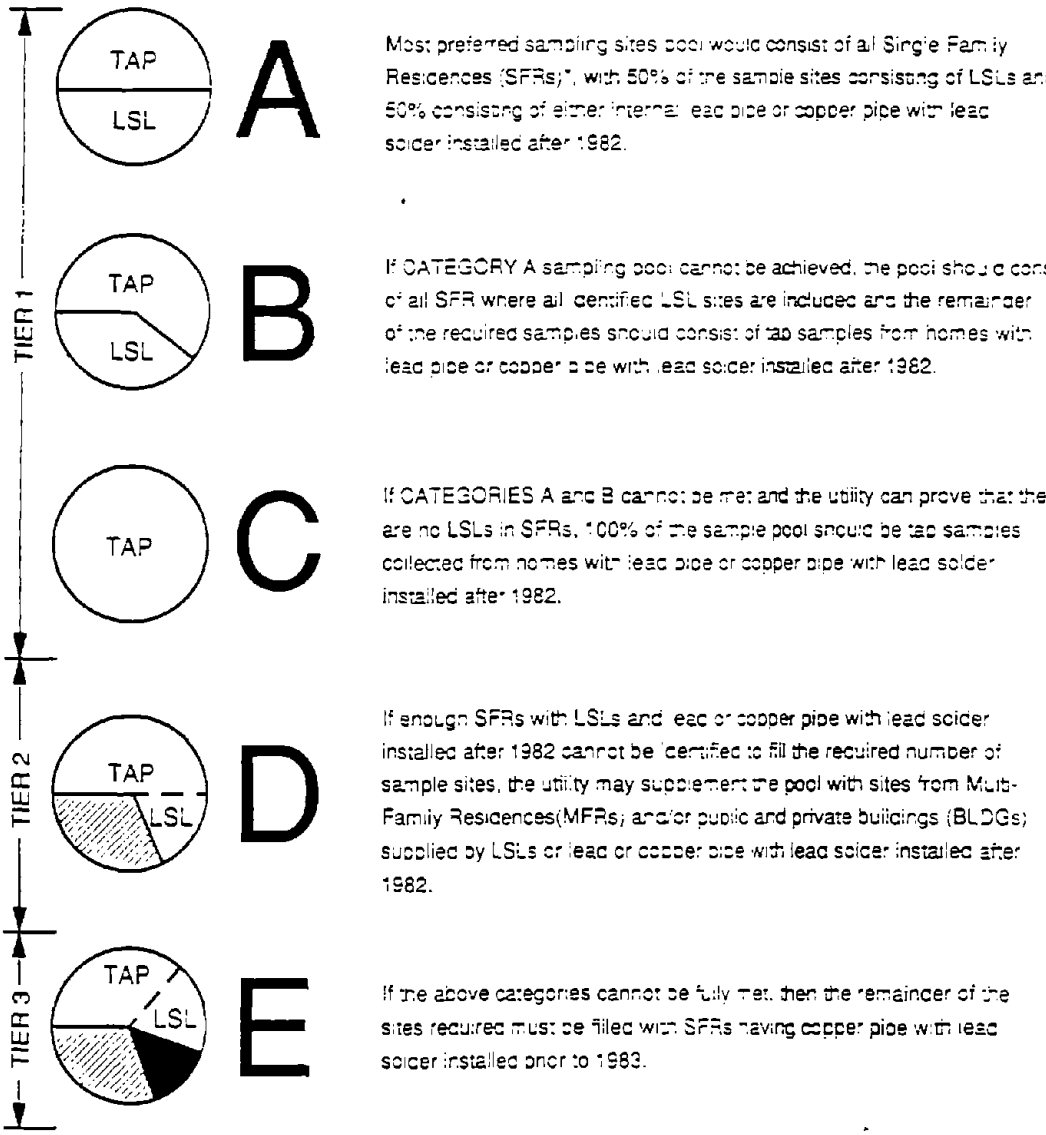
While the Rule does not require a PWS to identify additional sites, it is recommended that, at least initially, five times the number of required sites be selected for additional investigation as to their conformance with the specified high priority criteria. The Rule requires a "sufficiently large" pool be established to ensure that the required number of samples can be collected. It does not, however, quantify what is "sufficiently large." It is suggested that the targeted sampling pool to be maintained over time be between one and half, and two times the minimum required in order that alternative sites would be available to the PWS if a primary site became unavailable for repeat sampling. Once monitoring begins, the same sample sites must be used unless a location has to be dropped because of inaccessibility or because it no longer fits the requirements of a "priority site." It is at this time only that additional sites from the sampling pool are added to the actual monitored site locations.

The selected sampling sites are to be targeted, high priority sites; those sites which have the greatest likelihood of experiencing high lead and copper levels. Six possible configurations of a sample pool may result based on the highest to lowest desirability of the type of sites and the possibility of exceptional uses occurring. Figure 3-2 illustrates these six configurations, labeled as Sample Pool Categories A through F, where Category A is the most desirable configuration of sample sites, Category E is the least desirable configuration, and Category F represents the exceptional cases.

TIER 1

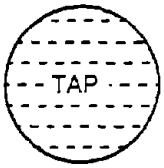
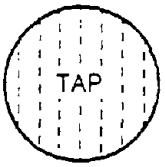
Category A: All sample sites in Category A would be considered high priority sites to lead and/or copper contamination. They consist of single family residences (SFRs) with lead interior piping or copper pipe with lead solder installed after 1982. A SFR is defined as any structure built as a single family residence but which is used either in that capacity or as a commercial enterprise. For those communities where multifamily residences (MFRs) make up over 20 percent of the total service connections in the PWS service area, then these structures may be included in the definition of SFRs for purposes of the targeted sample pool. Only one sample point (one unit) per multifamily residence should be selected. In addition, any SFR receiving potable water through a lead service line (LSL) is considered a high priority site and should be included. For those systems with a sufficient number of sites, 50% of their sample pool shall be SFRs with LSLs and the remaining 50% should contain lead interior plumbing or copper pipe with lead solder installed after 1982.

Figure 3-2. Preferred Sampling Pool Categories for Targeted Sampling Sites



*Note: If MFRs comprise at least 20% of the service connections in the water system, the MFRs may be included in CATEGORIES A,B, and C sampling pools if they meet the required criteria.

Figure 3-2. Preferred Sampling Pool Categories for Targeted Sampling Sites (Continued)

SAMPLE POOL	DESCRIPTION
 F.1	**F EXCEPTIONAL CASES** Category F.1 consists of those PWSs that only have plastic interior plumbing but cannot demonstrate "lead-free" conditions due to the presence of brass faucets. These systems should monitor at SFRs with brass faucets.
 F.2	Category F.2 includes those PWSs that only have sites where water softeners have been installed. These systems should select the highest risk sites (SFRs>82, SFRs_Pb, SFRs_LSL) and monitor at these locations even though the water softener is present.

LEGEND

Plastic interior plumbing but not "Lead-Free"

Water softeners at all available sites

Category B: If a PWS cannot identify enough SFRs with LSLs to fill 50% of the sample pool, then all of the available LSL sites from SFRs and MFRs meeting TIER 1 criteria should be included in the sample pool. The remainder should consist of SFRs with lead interior plumbing or copper pipe with lead solder installed after 1982.

Category C: If a PWS cannot identify any SFRs with LSLs but does have a sufficient number of SFRs with lead interior plumbing or copper pipe with lead solder installed after 1982, then the entire sample pool should consist of these sites.

TIER 2

Category D: If a PWS cannot identify enough SFRs with LSLs to fill 50% of the sample pool, and does not have enough SFRs meeting the criteria in Categories A through C to fill the sample pool, then the multi-family residence (MFRs) and/or public or commercial buildings (BLDGs) having lead interior pipe, copper pipe with lead solder installed after 1982, and/or LSL connections may be used to supplement the sample pool.

TIER 3

Category E: If a PWS cannot meet the conditions of the above categories, then it must fill any outstanding requirements with SFRs having copper pipe with lead solder installed prior to 1983.

EXCEPTIONAL CASES

Category F-1. PWSs that only have plastic plumbing, but cannot demonstrate that the system is "lead-free" because of the presence of brass faucets should monitor at SFRs with brass faucets.

Category F-2. PWSs where all available sites have water softeners should select the highest risk sites (SFR>82, SFR-Pb, SFR-LSL) and monitor at these locations even though the water softener is present.

Considering the limited amount of time available for the completion of a sample plan and material survey, PWSs should prioritize their material survey efforts along the lines of the sample pool categories. While the Rule does not explicitly require that the material survey identify all of the existing materials, it is recommended that a comprehensive survey be performed as this will assist the PWS in identifying appropriate sampling sites, not only for the targeted sampling pool, but also for distribution system samples. The following steps illustrate this approach in organizing material survey information for the development of a targeted sampling plan.

Step 1. Determine whether MFRs make up over 20 percent of the total connections served by the PWS, and if so, include them in the definition of a SFR through the following Steps.

Step 2. Locate the LSLs in the distribution system serving SFRs.

Step 3. Determine which SFRs installed copper pipe with lead solder after 1982. Consider the date that the lead ban went into effect in the PWS service area. PWSs may want to bracket their targeted sampling pool by SFRs built after 1982 and

before the lead ban implementation date.

Step 4. Determine the location of potential SFRs with lead interior piping.

Step 5. Identify any MFRs or BLDGs which installed copper pipe with lead solder after 1982. Consider the date that the lead ban went into effect in the PWS service area. PWSs may want to bracket their targeted sampling pool by MFRs or BLDGs constructed after 1982 and before the lead ban implementation date.

Step 6. Identify any MFRs/BLDGs with lead interior plumbing still in place.

Step 7. Identify those SFRs built prior to 1983 which have copper pipe with lead solder.

The results of the material survey can then be used to determine the Sample Pool Category most appropriate for your system. By completing Table 3-6, the Sample Pool Category may be identified and the process of selecting the specific sample sites may be initiated.

Potential sites can be identified through the material survey results. Select a group of potential sites equivalent to five times the number of samples required in each six month monitoring period. A field visit should be conducted to investigate and confirm which sites meet the target criteria. From the confirmed group of sampling sites, the PWS should select a final targeted sample pool consisting of between one and a half to two times the number of samples required. The final targeted sampling pool should contain sites located throughout the distribution system in order that different zones and/or areas of the distribution system with distinct piping materials may be represented. PWSs must maintain the highest priority sampling sites, and to the degree possible, achieve well-distributed sampling locations. Statements of permission or agreement to participate in the sampling program should be obtained from the owners of the property being considered. With each sampling event, if residents are collecting the first-draw samples, they will be required to certify that they were informed about sample collection procedures. An example of the instruction sheet with resident certification statement included is provided in Appendix A for reference. This information should be kept on file, but the PWS need only submit a statement that each tap sample collected by residents was taken afterthe water system informed them of proper sampling procedures (Form 141-A, found in Appendix A).

The final sample pool category for a utility may differ from that indicated by the material survey. Some factors which could cause this shift would be inability to solicit the participation of property owners, failure of sites to meet targeting criteria based upon field inspections, or practical concerns regarding utility personnel and property safety as needed for sample collection. Documentation of these factors is necessary to support the change in Sample Pool Category. The States do not have to approve any sampling plans prior to commencement of initial sampling. However, the location

Table 3-6. Determination of Sampling Pool Category for PWS Sampling Pool

SECTION A — General Information		
PWS FRDS Number	1	
Population Served by PWS	2	
Minimum Number of Samples Required from Users' Taps	3	

SECTION B — Refer to the results summarized in Table 3-3 to complete this section		
Total Numer of SFRs with Lead Interior Pipe	4	
Total Number of SFRs with Copper Pipe with Lead Solder Installed After 1982	5	
Total Number of SFRs with LSLs	6	
Sum Values in Boxes 4 and 5	7	
Total Number of MFRs and BLDGs with Lead Interior Plumbing, Copper Piping with Lead Solder Installed After 1982, or Served by a LSL	8	
Sum Values in Boxes 7 and 8	9	
Total Number of SFRs with Copper Piping with Lead Solder Installed Before 1983	10	
Sum Values in Boxes 9 and 10	11	

Table 3-6. Determination of Sampling Pool Category for PWS Sampling Pool (Continued)

SECTION C — Evaluate responses in Sections A and B above as indicated below. Begin with Category A and proceed downward until the criteria associated with the highest category possible produces a TRUE result			
CATEGORY	CRITERIA	PWS RESULTS	
		TRUE	FALSE
A	Box 7 ≥ Box 3 and Box 6 ≥ 0.5 * Box 3		
B	Box 7 ≥ Box 3 and 0 < Box 6 ≤ 0.5 * Box 3		
C	Box 7 ≥ Box 3 and Box 6 = 0		
D	Box 7 < Box 3 and Box 9 ≥ Box 3		
E	Box 7 < Box 3 and Box 9 < Box 3 and Box 11 ≥ Box 3		

of the site and the criteria under which they were selected must be submitted with the monitoring results. Further, if a Tier 2 or Tier 3 sampling pool results from the materials survey of a PWS, then the State must be notified of the conditions leading to this classification prior to commencement of initial sampling. If a Category B or C classification in Tier 1 sampling pool results from the materials survey of a PWS which has LSLs in the distribution system, then the State must be notified of the conditions leading to this classification prior to the commencement of the initial sampling.

3.5.2 — Distribution System Sampling Sites

The minimum number of sample sites required for the water quality parameter sampling is shown below by system size.

PWS System Size	Minimum Number of Water Quality Parameter Sites
>100,000	25
10,001—100,000	10
3,301—10,000	3
501—3,300	2
101—500	1
≤100	1

Samples are to be collected at locations representative of water quality conditions in the distribution system. Since PWSs identified representative sites for total coliform analyses, these same sites may be used for water quality parameter monitoring. The advantages associated with using these sites are (1) access is available since the PWS is currently using the sampling locations; (2) personnel are already in place to perform monitoring at these sites; and (3) the locations should be representative of the distribution system conditions as required by the Total Coliform Rule.

It is recommended that sites be selected within each identified zone within the service area, and that, to the degree possible, sample sites be located in the vicinity of the targeted sampling sites for lead and copper testing. Specific suggestions for distribution sample sites other than those listed above can be found in Section 4.2.2.

3.5.3 — Reporting Requirements for Sampling Plans

Should a PWS be unable to attain a Tier 1 sampling pool, justification for allowing lesser priority sites to be included in the sampling pool must be provided to the State prior to initial monitoring. The criteria for permitting Tiers 2 and/or 3 classifications are as follows:

1. The system must document via the materials evaluation that lead service lines, or interior lead piping was never used in the system or have all been replaced, or enough sites with these characteristics cannot be located.
2. The system must demonstrate that lead solder was never used in construction of residences and other buildings in the system or that the system cannot locate enough homes with lead solder installed after 1982.

Justification must be provided to the State prior to initial monitoring by those PWSs which meet the Tier 1 sample pool category, but which do not have sufficient

LSL sites to fulfill 50 percent of the minimum number of sample sites while having identified LSL sites in the distribution system. If a PWS does not have LSLs, then the system does not need to provide any justification to the State as long as the Tier 1 (Sample Pool Category C) is maintained.

For those systems with sampling pools meeting the Tier 1 classification requirements (Sample Pool Categories A or C), at a minimum, the following information must be present when reporting the results of initial monitoring to the State.

A. Lead and Copper Tap Sampling

1. The final Sample Pool Category (A-F) for the system.
2. Listing of sample site locations for tap samples indicating the targeting criteria for each site, such as SFR>82, SFR-Pb, SFR-LSL, etc.
3. The lead and copper tap sample results for each site monitored.
4. The calculated 90 percentile lead and copper levels for the six-month monitoring period.

B. Water Quality Parameter Sampling (For large PWSs and those medium and small PWSs exceeding an AL)

1. The location, distribution system sampling and analysis for water quality parameters (WQP-DIS).
2. The results of source water sampling and analysis for water quality parameters (WQP-POE).

As part of the sampling plan submitted to the State, it would be useful to include a distribution system map indicating the location of the sample sites. Because this is not required by the rule, this is discussed in more detail in Appendix B.

C. Lead and Copper Source Water Sampling (for systems exceeding an AL or wishing to demonstrate optimization based upon the 90%TL-POE value)

1. The results of the source water sampling.

3.6 — Examples

Two examples are provided to illustrate materials surveys for two community water supply systems. The first example illustrates a small system while the second example illustrates a larger system.

Example 3-1: Small Public Water System

A community water system serves a small, suburban development with 650 residential connections with approximately 2,275 consumers. The minimum number of targeted sample sites required is 20; and, should LSLs be found, then a minimum of 10 SFR-LSL site would have to be located to avoid having to justify to the State the insufficient number of LSLs. If no LSLs were found, then at least 20 SFRs meeting the Tier I criteria should be located. Otherwise Tier II and/or Tier III sites would have to be identified.

The age of the suburban residences ranges from new to 25 years old. The system is operated by a private utility. To initiate the materials survey, the utility, from billing records, distribution system maps, and the knowledge of the utility manager, identified several candidate groups of residences. In one

case, a neighborhood that was constructed after 1982 was located. Several other small neighborhoods, approximately 2 to 15 years old were also found within the system.

The utility confirmed the age of the residences in the candidate groups using the construction permit files at the local building department and the utility's billing records. Construction permits were also checked for kitchen and/or bathroom remodeling. The local plumbing codes were available for the entire lifetime of residences. From this data the utility learned:

1. In the first neighborhood, 50 percent of the houses were built after 1982 and had indoor plumbing with solder containing lead. These houses were placed into a group suitable for sampling (targeted sampling sites).
2. The plumbing codes allowed lead service lines in the older neighborhoods. The most senior field employee with the utility confirmed that lead service lines were used on occasion. The utility then researched record drawings of the distribution system and confirmed the presence of lead service lines in 25 percent of the houses. These residences were also placed into the group suitable for future sampling. Record drawings were incomplete for the remaining 10 percent. These homes had the meters checked for lead pipe. As none was found, these homes were dropped from consideration as lead service line sampling sites.

Plumbing and distribution data were placed with the connection and billing file in order to document this information. The utility also corrected the record drawings.

Example 3-2: Medium Public Water System

A medium-sized municipal utility serving approximately 30,000 residential connections performed a complete survey using the checklist items in Table 3-5. Suitable information was found for most areas and a group of targeted residences suitable for lead and copper sampling was established. However one large area of homes was found to be constructed in the 1983 to 1988 period, or the period between the targeted criteria and the enforcement date of the lead ban provisions of the SDWA. Records concerning the type of solder were missing and reference to the plumbing codes showed that lead solder was not specifically banned until 1988. To confirm the presence of lead solder, the utility performed water sampling and solder scrapings from the outside of joints on randomly selected houses located in the area of homes built between 1983 and 1988. Positive lead levels in water quality sampling correlated with solder scraping tests which indicated the use of lead solder. Elevated lead levels were also found in some cases where no lead solder existed. Since no lead piping was found at these locations, it was assumed by the PWS that the faucet fixtures or tested joints contained sufficient lead to consider the sites high priority locations. All residences that exhibited elevated lead levels were added to the targeted sampling group for the first draw plumbing system samples.

CHAPTER 4.0 — MONITORING PROGRAM REQUIREMENTS

4.1 — Introduction

The monitoring program requirements of the Lead and Copper Rule vary based on the PWS size and the actions required for a PWS. All PWSs are required to conduct *initial monitoring* for lead and copper at specific high risk sampling sites to determine what action, if any, they must take. All large PWSs and those small and medium sized PWSs exceeding the ALs in the initial monitoring step are required to conduct monitoring for several other water quality parameters from locations in the distribution system and at each entry point to the distribution system. Any size water system that exceeds an action level in the initial monitoring is also required to conduct lead and copper monitoring at the entry points to the distribution system.

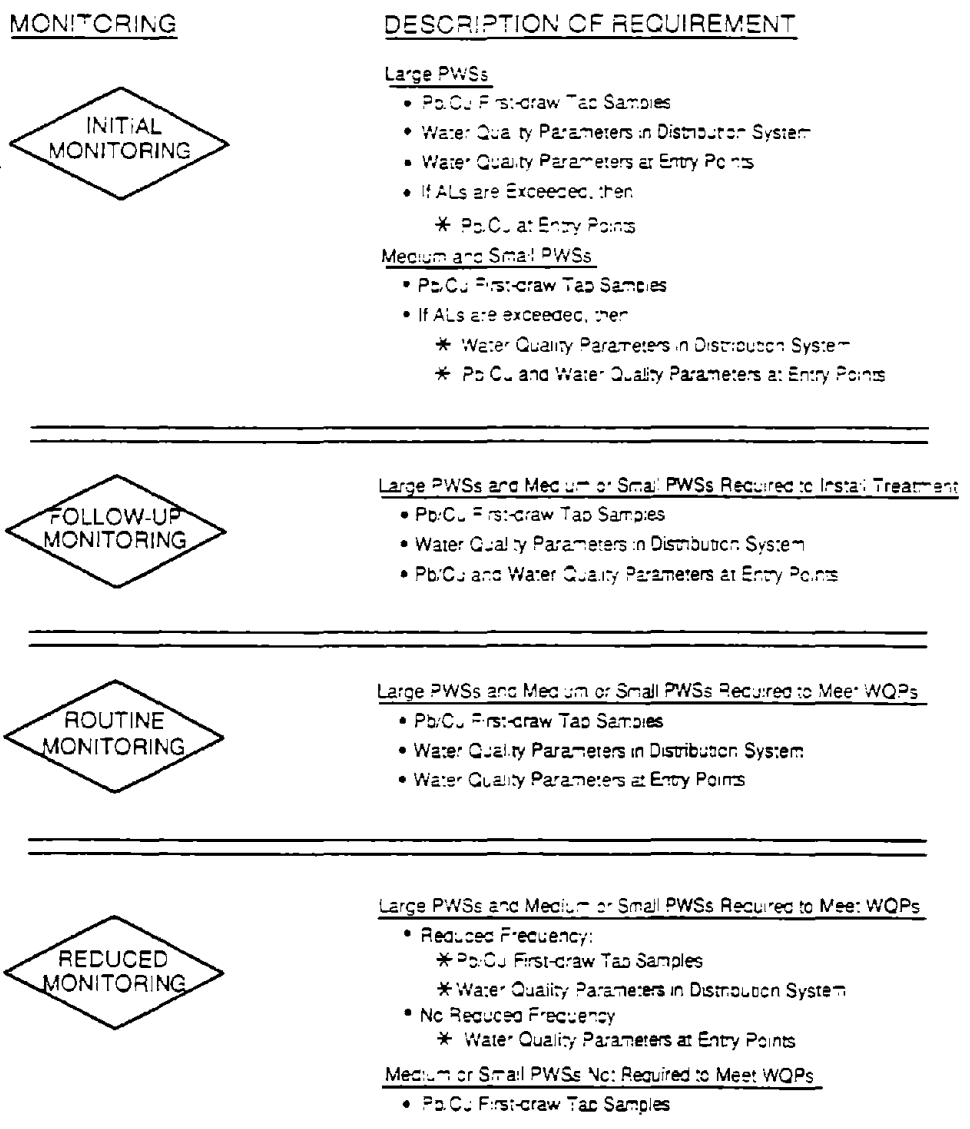
For those PWSs required to install treatment, whether that treatment consists of the reduction of lead and copper in the source water or corrosion control, *follow-up monitoring* is required for lead, copper, and the other water quality parameters. At the conclusion of follow-up monitoring, States will specify the water quality parameter ranges which all large PWSs and those medium and small PWSs that exceeded an AL in the follow-up monitoring must meet to continue to comply with the corrosion control aspects of the Rule. Routine monitoring is then performed. If the ALs are met by medium or small PWSs during a monitoring period in either follow-up or routine monitoring, then no additional water quality parameter monitoring is required in that period. The WQP sampling listed in Table 4-1 for these medium and small system may be discontinued and the results would not need to be submitted to the State for that monitoring period.

For those medium and small systems that meet the ALs for two consecutive periods in either initial, follow-up, or routine monitoring, the system may proceed directly to reduced monitoring. For those PWSs required to meet WQP ranges for compliance (all large systems and those medium and small systems exceeding an AL during routine monitoring), the State may allow these PWSs to perform reduced monitoring. These systems must meet the State-specified WQP ranges for two consecutive periods before applying to the State for reduced monitoring. These monitoring requirements are summarized in Figure 4-1.

Among the objectives of the monitoring program requirements are the following:

- Identify the contributions from different sources to lead and copper in drinking water.
- Allow States and public water suppliers to determine the corrosion behavior of the potable water supply system.

Figure 4-1. Illustration of Monitoring Requirements Included in the Lead and Copper Rule



- Assess the performance of selected treatment approaches to mitigate corrosivity and their impacts on the water treatment processes and finished water quality of the potable supply.
- Identify those communities which may be experiencing unacceptable risks due to excessive lead exposure in order that public education and information programs may be implemented.
- Identify those PWSs which may be required to implement a LSL replacement program.

In order to meet the above objectives, the monitoring program requirements include tap sampling from targeted homes or buildings for lead and copper, distribution system sampling for water quality parameters, and source water monitoring at the entry points to the distribution system for lead and copper as well as those water quality parameters indicative of treatment performance. Figure 4-1 illustrates the types of monitoring required under the Lead and Copper Rule.

This chapter presents the monitoring program requirements for PWSs and provides a summary of the State program requirements to implement the Lead and Copper Rule monitoring program.

4.2 — Analytical Methods

The approved analytical methods for lead, copper, and all water quality parameters (pH, calcium, alkalinity, silica, orthophosphate, conductivity, and temperature) are shown in Table 4-1. A summary of the preservation protocols, sample containers, and maximum holding times for analysis is provided in Table 4-2.

Laboratory certification will only be required for lead and copper analyses, and is based on the performance requirements included with the method detection limits. Additionally, in cases where sample compositing is done, laboratories must achieve the method detection limits found below using the procedure described in Appendix B to Part 136 of the Code of Federal Regulations.

Analyte and Method	Method Detection Limit (mg/L)	Practical Quantitation Level (mg/L)	Minimum Accuracy
Copper			
Atomic Absorption, furnace	0.001	0.050	± 10% at
Atomic Absorption, direct aspiration	0.020		≥0.050 mg/L
Atomic Absorption, platform furnace	0.001		
Inductively Coupled Plasma	0.002**		
Inductively Coupled Plasma, Mass Spectrometry	0.001		
Lead			
Atomic Absorption, furnace	0.001	0.005	± 30% at
Atomic Absorption, platform furnace	0.001		≥0.005 mg/L
Inductively Coupled Plasma, Mass Spectrometry	0.001		

** Using the 4X concentration technique which would not be required because the copper AL is much higher than the detection limits.

Table 4-1. Summary of Approved Analytical Methods for the Lead and Copper Rule

Parameter	Methodology[2]	Reference (Method Number) EPA[1]	ASTM[3]	SM[4]	USGS[5]
Lead	Atomic absorption; furnace technique	239.2	D3559-85D	3113	
	Inductively-coupled plasma; Mass spectrometry	200.8[6]			
	Atomic absorption; Platform furnace technique	200.9[7]			
Copper	Atomic absorption; furnace technique	220.2	D1688-90C	3113	
	Atomic absorption; direct aspiration	220.1	D1688-90A	3111-B	
	Inductively-coupled plasma	200.7[8]		3120	
	Inductively-coupled plasma; Mass spectrometry	200.8[6]			
	Atomic absorption; Platform furnace	200.9[7]			
pH	Electrometric	150.1	D1293-84B	4500-H[9]	
		150.2			
Conductivity	Conductance	120.1	D1125-82B	2510	
Calcium	EDTA titrimetric	215.2	D511-88A	3500-Ca-D	
	Atomic absorption; direct aspiration	215.1	D511-88B	3111-B	
	Inductively-coupled plasma	200.7[8]		3120	
Alkalinity	Titrimetric	310.1	D1067-88B	2320	
	Electrometric titration				
Orthophosphate, unfiltered, no digestion or hydrolysis	Colorimetric, automated, ascorbic acid	365.1		4500-P-F	
	Colorimetric, ascorbic acid, two reagent	365.3			
	Colorimetric, ascorbic acid, single reagent	365.2	D515-88A	4500-P-E	
	Colorimetric, phosphomolybdate;				I-1601-85
	automated-segmented flow;				I-2601-85
	automated discrete				I-2598-85
	Ion chromatography	300.0[10]	D4327-88	4110	
Silica	Colorimetric, molybdate blue;				I-1700-85
	automated-segmented flow				I-2700-85
	Colorimetric	370.1	D859-88		
	Molybdosilicate			4500-Si-D	
	Heteropoly blue			4500-Si-E	
	Automated method for molybdate-reactive silica			4500-Si-F	
	Inductively-coupled plasma	200.7[8]		3120	
Temperature	Thermometric			2550	

(Continued on next page – Footnotes only)

Table 4-1. Summary of Approved Analytical Methods for the Lead and Copper Rule (Continued)

[1] "Methods of Chemical Analysis of Water and Wastes," EPA Environmental Monitoring and Support Laboratory, Cincinnati, OH (EPA-600/4-79-020), Revised March 1983. Available from ORD Publications, CERI, EPA, Cincinnati, OH 45268.

[2] Annual Book of ASTM Standards, Vol. 11.01, American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

[3] "Standard Methods for the Examination of Water and Wastewater," 17th Edition, American Public Health Association, American Water Works Association, Water Pollution Control Federation, 1989.

[4] "Methods for Determination of Inorganic Substances in Water and Fluvial Sediments," 3rd edition, U.S. Geological Survey, 1989.

[5] "Determination of Metals and Trace Elements in Water and Wastes by Inductively-Coupled Plasma Atomic Emission Spectrometry," Revision 3.2, August 1990, U.S. EPA, EMSL, Cincinnati, OH 45268.

[6] "Determination of Trace Elements in Water and Wastes by Inductively-Coupled Plasma-Mass Spectrometry," Revision 4.3, August 1990, U.S. EPA, EMSL, EMSL, Cincinnati, OH 45268.

[7] "Determination of Trace Elements by Stabilized Temperature Graphite Furnace Atomic Absorption Spectrometry," August 1990, U.S. EPA, EMSL, Cincinnati, OH 45268.

[8] "Determination of Inorganic Ions in Water by Ion Chromatography," December 1989, U.S. EPA, EMSL, Cincinnati, OH 45268.

[9] For analyzing lead and copper, the technique applicable to total metals must be used and samples cannot be filtered.

Table 4-2. Sample Handling Requirements for Lead, Copper, and Water Quality Parameters

Contaminant or Parameters	Preservative	Container[1]	Maximum Holding Time[2]
Lead	Conc. HNO_3 to pH <2[3]	P or G	6 months
Copper	Conc. HNO_3 to pH <2[3]	P or G	6 months
pH	None	P or G	Test Immediately[4]
Conductivity	Cool, 4°C	P or G	28 days
Calcium	Conc. HNO_3 to pH <2[5]	P or G	6 months
Alkalinity	Cool, 4°C	P or G	14 days
Orthophosphate	Cool, 4°C	P or G	48 hours
Silica	Cool, 4°C	P only	28 days
Temperature	None	P or G	Test Immediately[4]

[1] P = Plastic, hard or soft; G = Glass, hard or soft.

[2] In all cases, samples should be analyzed as soon after collection as possible.

[3] If HNO_3 cannot be used because of shipping restrictions or is not used because homeowners are collecting samples, the sample for analysis can be shipped to a laboratory where it must be acidified (generally to pH < 2) with concentrated HNO_3 as soon as possible but not later than 14 days after sample collection. Sample must stand in the original container used for sampling for at least 28 hours after acidification. Laboratories should match the acid matrix of their samples, quality control, and calibration standards for accurate results. The latter two sets of solutions will have the same, fixed concentration of acid. It is recommended that good laboratory practice would be to determine by prior tests the amount of acid necessary to achieve some pH <2, and make it consistent with the standards used. For instance, for most waters, the previous EPA recommendation of 0.15% v/v of HNO_3 will result in a pH < 2. Therefore, all samples can be automatically preserved with 1.5 mL of the acid, and all standards can be made with the same acid concentration. In some extreme, high-alkalinity cases, more acid may be necessary.

[4] "Test Immediately" generally means within 15 minutes of sample collection. In the case of pH, the sample should be measured as soon as the sample is taken and should be measured under closes system conditions, particularly if the water is poorly buffered.

[5] If HNO_3 cannot be used because of shipping restrictions or safety concerns for sampling personnel, the sample for analysis may be initially preserved by icing and immediately shipping it to the laboratory. Upon receipt in the laboratory, the sample must be acidified with concentrated HNO_3 to pH < 2.

The use of the approved analytical methods for all of the water quality parameters as well as lead and copper is necessary in order to assure consistent results and high quality data. However, sample collection and analysis procedures in the field can contribute to errors in measurement. A quality assurance/ quality control program for field sampling/analysis and laboratory analysis should be developed and implemented by all PWSs. If a commercial or State laboratory performs the laboratory analyses, it is still important that quality control measures be taken for the field sampling portion of the monitoring program.

4.2.1 — Quality Assurance / Quality Control (QA / QC) Programs

A complete QA/QC program should contain components at each step in the data collection process, including sample collection and methods, laboratory sample handling and analysis, and recording/ reporting of the results. An important element in implementing a successful QA/QC program is the ability to properly track a sample from its collection through analysis and ultimate recording in either the State or PWS database. The QA/QC program requirements for sample tracking include: (1) sample identification; (2) complete sample labeling; (3) training sample collectors and field data collectors; (4) parallel construction of laboratory record-keeping and database format to sample labelling and identification; and, (5) periodic self-audits of the QA/QC procedures.

Significant benefits could be gained by the implementation of a program to properly label and identify samples to track their collection, analysis, and results. Minimally, the data fields (i.e., variables defined within the laboratory and/or PWS database) needed to fully identify a sample are:

1. PWS Identification Number
2. Applicable PWS Entry Point Identification Numbers (There may be multiple entry points to a distribution system which should be identified for each sample collected within it.)
3. Sample Identification Number
4. Sample Type Identifier: (2 Fields)
   (a) First-draw Tap, Distribution System, Source Water for Lead and Copper, Source Water for Water Quality Parameters, or LSL.
   (b) Initial, Follow-Up, Routine, Reduced, Ultimate Reduced, or LSL Replacement Program.
5. Sample Site Identifier: (3 Fields)
   (a) Region of Distribution System. (Suggest that Region 0 be assigned for each entry point location.)
   (b) Sub-region of Distribution System (Suggest that Sub-region 0 be assigned for each entry point location.)
   (c) Sample Site Specific Identifier
6. Sample Collection Date
7. Sample Collection Time
8. Sample Period
9. Sample Collector Identifier: PWS Staff, Resident, State, or Other.
10. Parameters for Analysis: Lead, Copper, Water Quality Para-

meters or pH and Temperature (field measurements).

11. Sample Site Street Address - for PWS use
12. Sample Collection Route - for PWS use
13. PWS Name
14. PWS Contact Person and telephone number

The PWS should include data fields to identify those samples delivered to the laboratory representing travel blanks and blind spikes. As part of a PWS's routine QA/QC program for analytical results, travel blanks should be included in at least 10 percent of the sampling kits delivered to and returned from home owners performing tap monitoring. Additionally, for lead and copper analyses, at least three blind spike samples should be included during every six-month monitoring period for medium and large PWSs, and at least one such sample for small PWSs.

When first-draw tap samples are to be collected, the sample bottles must be properly labelled prior to distribution if residents are collecting the samples. In addition to the sample bottles, PWSs must supply the residents with instructions as to the sample collection procedures. The PWS must certify that residents were informed of the sampling procedures prior to collecting the samples. If PWS staff are collecting the first-draw tap samples, then they are required to certify that to the best of their knowledge, each sample represents first-draw samples. PWSs will be required to submit a statement to the State at the end of each six-month monitoring period that these certificates were obtained (see Form 141-A in Appendix A).

4.2.2 — Sample Handling Procedures for Lead and Copper

Sampling for lead and copper in either tap or source water requires some special considerations. First-flush samples from homes should be collected by gently opening the tap and filling the one-liter plastic sample bottle. For those systems that do not use disposable sample bottles, the acid-soaking procedure for glassware, discussed in this section, should be followed before re-use. For those PWSs which allow the home owners to collect the tap sample, a suggested direction sheet which may accompany the sample bottle is provided in Appendix A.

The ALs contained in the Lead and Copper Rule are based on total lead and copper. Metals can be present in several forms in a sample of water: soluble, particulate, or as a dissolved constituent but adsorbed onto a particle. The analyses for total metals include steps which make each form of the metal available for measurement. This is accomplished by first acidifying the sample to approximately a pH 2 through the addition of nitric acid (see third footnote of Table 4-2). Particulate lead and copper dissolve and enter solution under these low pH conditions. The sample is then subjected to a digestion step which applies elevated temperatures and agitation to further dissolve particulate and adsorbed lead and copper and to concentrate their presence in a smaller volume of sample for analysis.

The approved analytical methods were purposely selected to measure the total metal content of samples since the human body can absorb both particulate and dissolved constituents.

Care must be taken to assure that the glassware used in each of the sample handling steps is free of trace amounts of lead and copper as this can introduce a significant degree of analytical error. To reduce such errors, especially in cases where very low lead concentrations are expected, acid soak all appropriate glassware for 2 hours prior to use. The recommended acid-soaking procedure is one part nitric acid, two parts hydrochloric acid, and nine parts good quality laboratory water, such as deionized water.

PWSs finding unusually high lead or copper levels in any samples should consider performing filtered lead and copper analyses in the future in addition to the total analyses. Sample collection can cause particulates to be sheared from the pipe walls causing sporadic spikes in lead and copper levels found in the monitoring program. Results from recent corrosion control studies have confirmed that lead solder can become 'flaky' and release particulates into first-draw tap samples (Neukrug, 1991). Identifying elevated metal levels as particulates may assist PWSs and States in targeting appropriate actions and assessing treatment performance. Filtered metal analysis requires the use of special procedures. [References for dissolved metal analysis are: Schock and Gardels, 1983, *JAWWA*, 75(2):87; Harrison, R.M. & P.H. Laxen, 1980, *Nature* (August 21):791-793; deMora, S.J. et al., 1987, *Water Res.* 21(1):83-94; Brach, R.A., et al., 1991, *Proc. AWWA Annual Conf.* (Philadelphia); Hulsmann, A.D., 1990, *IWEM* (Feb.):19-25.] Split-sampling must be used to generate filtered and total metal analyses. Regardless of the filtered analysis results, the total metal content measured must be reported to the State.

Those PWSs required to install treatment to remove lead and copper prior to distribution should monitor lead and copper levels in the raw water and, if appropriate, at intermediate points within the treatment plant. Additionally, sampling is required at each entry point to the distribution system.

4.2.3 — Sample Handling Procedures for Water Quality Parameters

The Rule requires that distribution system samples be collected for the analysis of water quality parameters. The objective of these requirements is the determination of the water quality conditions representative of each location. To reduce any sampling error or site-specific influences on the monitoring results, the following general steps and conditions should be considered when sampling:

- Avoid areas of the distribution system where maintenance or flushing is being conducted as water quality upsets are likely to be encountered: Since the purpose of water quality parameter monitoring is to identify the typical conditions existing in the distribution system, introducing anamolous data would only add

confusion and error to data analyses and interpretations.

- Select distribution system sites which are distributed throughout the entire service area to include locations representing the distribution system characteristics as follows, ranked by relative importance to site-selection decisions: (1) in the vicinity of targeted tap monitoring sites, (2) detention time within the distribution system, (3) within distinct pressure zone, (4) distribution system materials, (5) relationship to supplemental chlorination feed points, and (6) ground or elevated storage locations.
- If fire hydrants or other distribution system fixtures are in the vicinity of a sampling site, fully flush the sample tap prior to collecting the sample.
- Samplers should always record their observations about color, suspended solids, and the flushing time required prior to achieving acceptable sampling conditions to assist in the interpretation of the analytical results and overall distribution system behavior.

Those analyses to be performed in the field are pH and water temperature. Conductivity may be performed either in the field or laboratory. Temperature may be measured either by a hand-held thermometer or by a combined temperature/pH electrode and meter. In all cases, pH measurements must use a pH electrode and meter. All of the remaining analyses, water quality parameter as well as lead and copper, should be performed by a laboratory.

The EPA specified that pH and temperature measurements are to be collected on-site for the following reasons:

1. Temperature variations during transport do occur, invalidating any laboratory measurements of temperature and introducing error into the pH analysis. Temperature differentials of 5 to 10°C can introduce substantial shifts in pH. Since correcting for such error is difficult, EPA believes that taking field measurements for pH and temperature simplifies the efforts for PWSs and provides higher confidence in the data. More detailed discussions of temperature impacts on pH measurements may be found in Appendix G of the AWWA Research Foundation publication Lead Control Strategies (1990).
2. Chemical changes may occur within the smaple during transport which could introduce variability in the pH measurements. The loss and/or gain of carbon dioxide from solution can result in pH increases and/or decreases, respectively. Additionally, continued disinfectant residual reactions can induce pH shifts.

Colorimetric analyses for pH do not produce sufficiently accurate results, and so have not been included by EPA in the approved analytical methods for pH analysis. These methods are subject to several shortcomings: (1) each field sampler subjectively judges the results, such that large variability in the data can be found among sample sites and sampling events; (2) the reagents used

in the analysis degrade over time, increasing the likelihood of error being introduced into the results; and (3) under ideal conditions, the accuracy of the method is only ± 0.2 pH units.

The minimum sample volumes recommended for the water quality parameters in "Methods for Chemical Analysis of Water and Wastes" [USEPA, 1983, "Methods for Chemical Analysis of Water and Wastes". EPA 600/4-79-020] are presented below.

Water Quality Parameter	Minimum Sample Volume
Conductivity	50 mL
pH	25 mL
Temperature	1000 mL
Calcium	100 mL
Orthophosphate	50 mL
Silica	50 mL
Alkalinity	100 mL

Since temperature and pH are to be measured in the field, a single sample may be used for their analysis. PWSs with poorly buffered water supplies may consider performing pH analyses under a "closed system" to reduce measurement shift and increase the accuracy of the pH analyses [Schock, M., et al., 1980, *JAWWA*, 72(5):304; Schock, M. and S.C. Schock, 1982, *Water Research*, 16:1455]. Under no circumstances should the pH electrodes, conductivity probes, or thermometers be placed in samples that are to be analyzed for the other water quality parameters.

Based on the sample handling procedures provided in Table 4-2, plastic or glass containers can be used in all cases except if silica analyses are required, where only plastic may be used. Since temperature and pH measurements are performed in the field, the other water quality parameters will require two samples of approximately 500 mL each to be collected (this assumes that either orthophosphate or silica is included). These volumes are based upon the recommendation that at least twice this minimum volume be collected, permitting replicate analyses if desired. Two samples are required because calcium analysis is to be performed using a separate sample in order to acidify the sample prior to measurement. It is further recommended that the sample acidification step for calcium be performed in the laboratory by trained personnel upon receipt of the sample. It should be noted that if orthophosphate is to be measured, this analysis must be performed within 48 hours of sample collection.

Before beginning the distribution system sampling, the pH electrode should be calibrated at pH 7.0 and a second pH level, either 4.0 or 10.0, depending on the pH range typically found within the distribution system. For most systems, the second pH level for calibration should be pH 10.0. For more accurate results, the pH standard solution used for calibration should be near the temperature anticipated for the water in the distribution system even if the pH meter is temperature compensated. In most cases, the water temperature of the finished water will be representative of the temperature found in the distribution system. In order to attain the desired temperature for example, a small amount of buffer solution could be placed in a

closed container in a flow-through water bath overnight.

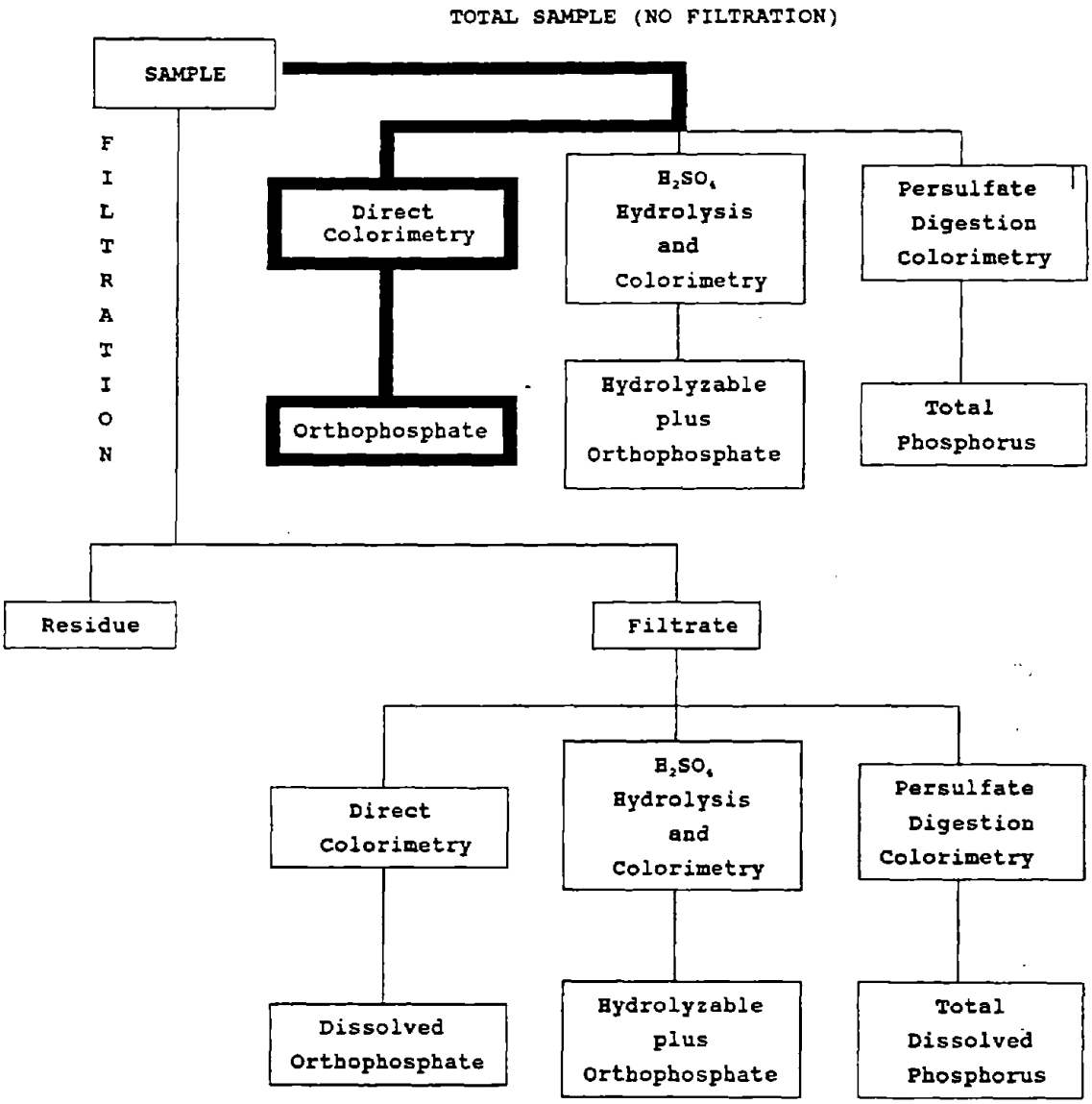
During transport, the pH probe should be placed in a sample bottle and secured in the vehicle. The pH probe membranes are very delicate, and they should not come in contact with hard surfaces or be allowed to dry out. It may be a good idea to pack a replacement probe (calibrated prior to leaving) in case problems are experienced with the primary probe.

During sample collection for the water quality parameters, care should be taken to avoid over-agitation of the water sample. Remove the faucet aerator, if present, and run the water gently to flush the line prior to sample collection. Fill the sample bottle to slightly overflowing. A closed-system sample bottle, designed to insert the thermometer and/or pH probe should be used in order to reduce measurement error. If using a hand-held thermometer, insert it in the sample and record the reading when it stabilizes. After removing the thermometer, insert the pH electrode immediately. If using a combined electrode, insert it into the sample bottle directly after filling it and measure the sample temperature. After recording the temperature, change the meter to reading pH levels. Gently rotate the bottle with the probe inside until the pH reading stabilizes; this could take several minutes. When stable, record the measurement, rinse the electrode with deionized water and replace it in its holding bottle. When the temperature and pH measurements are completed, discard the sample. Recalibrate the pH probe if not used over an extended period of time to adjust any measurement shift which may have occurred and record this information.

While small changes in the levels of conductivity, alkalinity, calcium, orthophosphate, and silica may occur between the time of a sample's original collection and its analysis in the laboratory, the error introduced by the delay should be negligible as long as the sample bottles are fully filled, kept cool throughout the day, and the handling practices summarized in Table 4-2 are followed. If these parameters are measured as part of the normal operating practices of the utility, then the distribution system and entry point water samples should be analyzed in exactly the same fashion and by the same personnel. This will allow the data collected to be directly comparable to water quality data collected throughout the water treatment plant.

For those PWSs which apply a phosphate-based corrosion inhibitor, measurement of orthophosphate is required. These samples must be unfiltered with no digestion or hydrolysis step performed. The direct colorimetric approach as highlighted in Figure 4-2 is required. This method prevents the conversion of polyphosphate constituents to the orthophosphate form prior to measurement. However, polyphosphates which have converted to orthophosphate in the distribution system will be detected by this scheme. EPA's rationale for this requirement is the lack of evidence supporting the ability of polyphosphates to control lead corrosion. The inclusion of polyphosphates in the measurement of orthophosphate would over-estimate the active corrosion protection being provided.

Figure 4-2. Analytical Scheme for Differentiation of Phosphorus Forms



4.3 — Sample Collection Methods

Four types of samples may be collected in the course of monitoring by utilities: first-draw tap samples, distribution system water quality parameter samples, lead service line samples (in cases where LSL replacement is required and exemption of individual LSLs is desired by the PWS), source water samples for lead, copper and operating parameters. The general sample collection protocols for each type as described below should be followed:

- *First Draw Tap Samples*: Samples can be collected any time as long as the water has stood undisturbed in the pipes for at least 6 hours. Water use during the day before sample collection should have been typical of its daily use when occupied. PWSs should request home owners to indicate when water had last been used in the house prior to sampling and the time that the sample was collected. Estimating the stagnation period may assist PWSs in data interpretation, especially when excessively long stagnation periods are encountered (more than 12 hours).

  A clean, plastic, one-liter sample bottle should be placed below the spout of the cold water tap in the kitchen. The cold water tap should be turned on gently to maintain low flow conditions during sample collection such that the one liter bottle is filled in approximately 45 seconds. The sample bottle should be filled to the one-liter level marked on the container, and then capped. Acidification of the sample should be completed by the laboratory personnel upon receipt of the sample, but in no case later than 14 days after the sample collection. Neither the home owners nor the sample collectors should handle the nitric acid used for sample acidification.

- *Water Quality Parameter Samples*: A detailed description of the field sample collection protocol for pH and temperature was provided in Section 4.2. Distribution system samples for alkalinity, calcium, conductivity, orthophosphate, and silica will require two samples of approximately 500 mL each to be collected.

  Fully flush the sample tap prior to collection of the sample.

  If collecting these samples from the same location as coliform and disinfectant residual samples, then samples should be collected in the following manner:

  - Fully flush the sample tap and collect the coliform sample;
  - Collect a sample to measure disinfectant residual;
  - Collect and analyze a sample for temperature and pH;
  - Collect the samples for the other water quality parameter analysis.

  The water quality parameter samples to be brought back to the laboratory for analysis should be stored separately from the coliform samples in order to prevent contamination. In all cases, store in a cool environment until analyzed.

- *LSL Samples*: A one-liter sample representing water from the service

line which has been standing for at least six hours may be collected by those systems required to implement a LSL replacement program. However, such sampling is not required if the system chooses to simply replace the line. In cases where LSLs are sampled, LSLs which do not exceed the lead AL may be exempted from replacement.

Three methods are available for collecting LSL samples: (1) flushing a specified volume from the kitchen tap; (2) direct sampling of the service line; and, (3) flushing the kitchen tap until a change in temperature is noted. A brief description of each follows.

Flushing a Specified Volume: From the field inspection of the site, the pipe length and diamter from the kitchen tap to the service connection and the length and diameter of the service connection itself should be estimated. Estimate the volume of water within the interior plumbing using the chart provided below. Flushing the estimated volume is necessary in order to receive service connection water at the kitchen tap. Open the tap and flush the estimated volume into a graduated beaker or cylinder, then close the tap. Next, collect a one-liter sample from the sampling tap by filling the sample bottle to the one-liter mark, then cap immediately. Acidification of the sample should be completed by the laboratory personnel upon receipt of the sample, but in no case later than 14 days after sample collection. Neither the home owners nor the sample collectors should handle the nitric acid used for sample acidification.

EPA believes that utility personnel should collect samples when using this approach due to the potential difficulties in accurately estimating the volume necessary to collect the LSL sample.

Direct Service Line Samples: If the LSL is accessible, or could feasibly be made accessible, a tap could be installed directly into the line for sample collection purposes. The sample tap should be constructed of all lead-free materials, definitely avoiding brass. Brass can leach a considerable amount of lead. A copper or plastic fitting with plastic piping to the tap would provide a lead-free environment.

The installation of a tap directly into the LSL could disturb the pipe conditions and induce additional corrosion activity by destroying established, protective layers or by introducing galvanic reactions. In addition, the expense of installing taps into service lines could make this option infeasible in many cases. It would make little sense to dig up service lines to install a sample tap, when the line itself may need to be replaced due to the results of the sampling effort. This option would not be recommended unless existing taps to the service line are in place.

Nevertheless, if the tap is installed, the line should be flushed for several hours to ensure that any debris caused by the installation is removed so that it will not impact later sampling.

Pipe Volume Table (Volumes Listed in Liters)						
Pipe Length (Feet)	Pipe Diameter (In.)					
	3/8	1/2	5/8	3/4	1	1-1/4
2	.06	.09	.14	.19	.32	.50
3	.09	.14	.21	.29	.49	.74
4	.11	.18	.27	.38	.65	.99
5	.14	.23	.34	.48	.81	1.24
6	.17	.27	.41	.57	.97	1.48
7	.20	.32	.48	.67	1.14	1.73
8	.23	.36	.55	.76	1.30	1.98
9	.26	.41	.62	.86	1.46	2.22
10	.28	.45	.69	.95	1.62	2.47
11	.31	.50	.75	1.05	1.78	2.72
12	.34	.55	.82	1.14	1.95	2.96
13	.37	.59	.89	1.24	2.11	3.21
14	.40	.64	.96	1.33	2.26	3.46
15	.43	.68	1.03	1.43	2.43	3.71
16	.46	.73	1.10	1.52	2.60	3.95
17	.49	.78	1.16	1.62	2.76	4.20
18	.51	.82	1.23	1.71	2.92	4.45
19	.54	.86	1.30	1.81	3.08	4.70
20	.57	.91	1.37	1.90	3.24	4.94
25	.71	1.14	1.71	2.38	4.06	6.18
30	.86	1.36	2.06	2.85	4.87	7.41
35	1.00	1.59	2.40	3.33	5.68	8.65
40	1.14	1.82	2.74	3.80	6.49	9.88
60	1.43	2.27	3.43	4.76	8.11	12.36

Notes:
1. Volumes can be added together for pipe lengths not listed.
2. Liters can be converted to gallons by dividing by 3.785.

After flushing, the water must stand in contact with the LSL for at least six hours before sampling. In those communities where the meters are located prior to the structure or in unmetered areas, taps may already exist on the service line itself. In these cases, direct sampling can be conducted without the installation of a special tap. When samples are to be collected, the water should be run initially to flush the pipe connecting the faucet and the service line. That is, the faucet may be located some distance from the service line and connected by a length of pipe which should be flushed prior to collecting the LSL sample. For example, exterior faucets oftentime tap directly into the service line, but a short distance of piping connects the faucet to the service line. Collect the one-liter sample as described previously. Acidification of the sample should be completed by the laboratory personnel upon receipt of the sample, but in no case later than 14 days after sample collection. Neither the home owners nor the sample collectors should handle the nitric acid used for sample acidification.

Temperature Variation: This method for collecting a LSL sample is recommended for those cases when a clear delineation in LSL and interior piping temperatures can be discerned. For example, during winter months, water held in the interior plumbing of a heated home will be significantly warmer than the water standing in a service line. However, there are some locations where this method should not be relied upon for LSL sampling. For example, in temperate climates the difference in water temperatures may not be readily distinguished. Also, homes that have a crawl space instead of a basement may have colder water in the crawl space than in the interior plumbing.

For the temperature variation type of sampling, the sample collector should gently open the kitchen tap and run the water at a normal flowrate, keeping a hand/finger under the flowing water. When a change in water temperature is detected, a one-liter sample should be collected by filling the sample bottle to the appropriate level and capping. Acidification of the sample should be completed by the laboratory personnel upon receipt of the sample, but in no case later than 14 days after sample collection. Neither the home owners nor the sample collectors should handle the nitric acid used in sample acidification.

- *Source Water Samples*: PWSs are required to collect source water samples when treatment for either the removal of lead and copper or else corrosion control is required. Samples are to be collected from each entry point to the distribution system representing each source of supply after treatment has been applied. For surface water systems, this may be done after storage or at the high service pumps. For groundwater systems with separate entrances to the distribution system from either individual wells or well fields, a

sample must be collected from each discrete entrance point. If new sampling taps to wells are required, it would be best not to use brass, as brass units may contaminate the sample. If brass taps are installed, then the line should be adequately flushed prior to sampling to ensure the sample is representative of the source. States have the discretion to identify an individual well for monitoring (when there is no treatment or blending) for those PWSs using multiple wells that draw from the same aquifer. Also, compositing of up to five source water samples may be allowed by the States for lead and copper analysis. If the concentration in the composited sample exceeds the method detection limit shown in Section 4.2, then individual follow-up samples must be collected from each well and reanalyzed within 14 days.

Source water samples can be required for both lead and copper analyses and water quality parameter analyses. The number of samples and frequencies are discussed in Section 4.4.

4.4 — Monitoring Frequency

Tables 4-3 and 4-4 present the monitoring frequencies associated with (1) initial and follow-up monitoring, and (2) reduced monitoring events. The monitoring frequency for large PWSs is the same for the initial and follow-up monitoring steps. Small and medium sized systems which met the ALs may proceed directly to reduced monitoring and only monitor for lead and copper. These systems can further reduce the frequency of tap monitoring if the ALs are met for three consecutive years during reduced monitoring. Any system which installed treatment and is maintaining the State approved operating parameters for two consecutive six-month monitoring periods can reduce their monitoring frequency as shown in Table 4-4 after receiving approval from the State. For those systems which consistently demonstrate this level of performance for three years consecutively, the State may further reduce the monitoring requirements.

It is recommended that distribution system monitoring and tap monitoring be coordinated such that the water quality conditions represented in the distribution system may be related to the tap monitoring results. A method of coordinating these sampling efforts would be to associate groups of distribution system sampling sites with groups of tap sampling sites. Monitoring schedules may be developed to target a 48-hour timeframe for the collection of a group's tap and distribution system samples. These sampling groups may be identified by the PWS distribution system zone as delineated in the sampling plan or by the coliform monitoring program.

Since medium and small systems must complete the water quality parameter monitoring before the end of a six-month monitoring period in which an AL is exceeded, PWSs should consider conducting the WQP monitoring concurrently with the targeted tap monitoring. This may be especially critical when the tap monitoring is conducted toward the end of the six-month period. Additionally, concurrent WQP and tap monitoring

Table 4-3(a). Monitoring Frequency for Initial Sampling Requirements

PWS Size	Monitoring Type	Location	No. Samples	Frequency
Large PWSs				
>100,000	Lead and Copper	Taps	100	6-months
	Water Quality Parameters	Distribution System	25	Twice per 6-months
	Source Water	Entry Points		
	Lead and Copper		1	6-months*
	Water Quality Parameters		1	Twice per 6-months
50,000—100,000	Lead and Copper	Taps	60	6-months
	Water Quality Parameters	Distribution System	10	Twice per 6-months
	Source Water	Entry Points		
	Lead and Copper		1	6-months*
	Water Quality Parameters		1	Twice per 6-months
Medium PWSs				
10,001—50,000	Lead and Copper	Taps	60	6-months
	If ALs Exceeded			
	Water Quality Parameters	Distribution System	10	Twice per 6-months
	Source Water	Entry Points		
	Lead and Copper		1	6-months
	Water Quality Parameters		1	Twice per 6-months
3,301—10,000	Lead and Copper	Taps	40	6-months
	If ALs Exceeded			
	Water Quality Parameters	Distribution System	3	Twice per 6-months
	Source Water	Entry Points		
	Lead and Copper		1	6-months
	Water Quality Parameters		1	Twice per 6-months
Small PWSs				
501—3,300	Lead and Copper	Taps	20	6-months
	If ALs Exceeded			
	Water Quality Parameters	Distribution System	2	Twice per 6-months
	Source Water	Entry Points		
	Lead and Copper		1	6-months
	Water Quality Parameters		1	Twice per 6-months
101—500	Lead and Copper	Taps	10	6-months
	If ALs Exceeded			
	Water Quality Parameters	Distribution System	1	Twice per 6-months
	Source Water	Entry Points		
	Lead and Copper		1	6-months
	Water Quality Parameters		1	Twice per 6-months
≤100	Lead and Copper**	Taps	5	6-months
	If ALs Exceeded			
	Water Quality Parameters	Distribution System	1	Twice per 6-months
	Source Water	Entry Points		
	Lead and Copper		1	6-months
	Water Quality Parameters		1	Twice per 6-months
Non-Transient Non-Community Water Systems	Lead and Copper Water Quality Parameters	Taps Distribution System	No more than one per building per monitoring period	

* If system wants to attempt to demonstrate optimization based on difference between source water levels and 90% tap level. Otherwise, one sample per entry point required if an AL is exceeded.

** For lead and copper monitoring, 20% of the homes may be used in lieu of the required if there are less than 5 or 10 available sites, respectively.

Table 4-3(b). Monitoring Frequency for Follow-up and Routine Sampling Requirements

PWS Size	Monitoring Type	Location	No. Samples	Frequency
Large PWSs				
>100,000	Lead and Copper	Taps	100	6-months
	Water Quality Parameters	Distribution System	25	Twice per 6-months
	Source Water	Entry Points		
	Lead and Copper		1	6-months*
	Water Quality Parameters		1	Biweekly
50,000—100,000	Lead and Copper	Taps	60	6-months
	Water Quality Parameters	Distribution System	10	Twice per 6-months
	Source Water	Entry Points		
	Lead and Copper		1	6-months*
	Water Quality Parameters		1	Biweekly
Medium PWSs				
10,001—50,000	Lead and Copper	Taps	60	6-months
	Water Quality Parameters	Distribution System	10	Twice per 6-months
	Source Water	Entry Points		
	Lead and Copper		1	6-months*
	Water Quality Parameters		1	Biweekly
3,301—10,000	Lead and Copper	Taps	40	6-months
	Water Quality Parameters	Distribution System	3	Twice per 6-months
	Source Water	Entry Points		
	Lead and Copper		1	6-months*
	Water Quality Parameters		1	Biweekly
Small PWSs				
501—3,300	Lead and Copper	Taps	20	6-months
	Water Quality Parameters	Distribution System	2	Twice per 6-months
	Source Water	Entry Points		
	Lead and Copper		1	6-months*
	Water Quality Parameters		1	Biweekly
101—500	Lead and Copper	Taps	10	6-months
	Water Quality Parameters	Distribution System	1	Twice per 6-months
	Source Water	Entry Points		
	Lead and Copper		1	6-months*
	Water Quality Parameters		1	Biweekly
≤100	Lead and Copper**	Taps	5	6-months
	Water Quality Parameters	Distribution System	1	Twice per 6-months
	Source Water	Entry Points		
	Lead and Copper		1	6-months*
	Water Quality Parameters		1	Biweekly
Non-Transient Non-Community Water Systems	Lead and Copper Water Quality Parameters	Taps Distribution System	No more than one per building per monitoring period	

* If source water treatment installed; otherwise, see reduced monitoring requirements.

** For lead and copper monitoring, 20% of the homes may be used in lieu of the required if there are less than 5 or 10 available sites, respectively.

Table 4-4. Monitoring Frequency for Reduced Sampling Requirements

PWS Size	Monitoring Type	Reduced* Monitoring	Ultimate Reduced** Monitoring
Large PWSs			
>100,000	Lead and Copper	50 per year	50 per 3 years
	Water Quality Parameters	10 twice per 6 months	10 twice per year
	Points of Entry		
	Lead and Copper		
	Ground Water Supply	1 per 3 years	1 per 9 years
	Surface Water Supply	Annually	1 per 9 years
	Water Quality Parameters	Biweekly	Biweekly
50,001—100,000	Lead and Copper	30 per year	30 per 3 years
	Water Quality Parameters	7 twice per 6 months	7 twice per year
	Points of Entry		
	Lead and Copper		
	Ground Water Supply	1 per 3 years	1 per 9 years
	Surface Water Supply	Annually	1 per 9 years
	Water Quality Parameters	Biweekly	Biweekly
Medium PWSs			
10,001—50,000	Lead and Copper	30 per year	30 per 3 years
	Water Quality Parameters	7 twice per 6-months	7 twice per year
	Points of Entry		
	Lead and Copper		
	Ground Water Supply	1 per 3 years	1 per 9 years
	Surface Water Supply	Annually	1 per 9 years
	Water Quality Parameters	Biweekly	Biweekly
3,301—10,000	Lead and Copper	20 per year	20 per 3 years
	Water Quality Parameters	3 twice per 6-months	3 twice per year
	Points of Entry		
	Lead and Copper		
	Ground Water Supply	1 per 3 years	1 per 9 years
	Surface Water Supply	Annually	1 per 9 years
	Water Quality Parameters	Biweekly	Biweekly
Small PWSs			
501—3,300	Lead and Copper	10 per year	10 per 3 years
	Water Quality Parameters	2 twice per 6-months	2 twice per year
	Points of Entry		
	Lead and Copper		
	Ground Water Supply	1 per 3 years	1 per 9 years
	Surface Water Supply	Annually	1 per 9 years
	Water Quality Parameters	Biweekly	Biweekly
101—500	Lead and Copper	5 per year	5 per 3 years
	Water Quality Parameters	1 twice per 6-months	1 twice per year
	Points of Entry		
	Lead and Copper		
	Ground Water Supply	1 per 3 years	1 per 9 years
	Surface Water Supply	Annually	1 per 9 years
	Water Quality Parameters	Biweekly	Biweekly
≤100	Lead and Copper**	5 per year	5 per 3 years
	Water Quality Parameters	1 twice per 6-months	1 twice per year
	Points of Entry		
	Lead and Copper		
	Ground Water Supply	1 per 3 years	1 per 9 years
	Surface Water Supply	Annually	1 per 9 years
	Water Quality Parameters	Biweekly	Biweekly

* If in compliance for 2 six-month periods after state specifies water quality parameters.

** If in compliance for 3 years after State specifies water quality parameters.

NOTE: Medium and small PWSs that meet the ALs for two consecutive six-month periods are only required to monitor for lead and copper.

could assist PWSs in making their treatment recommendations to the State should an AL be exceeded.

Source water monitoring for lead and copper is to be conducted by those systems which exceed the ALs. The source water monitoring is intended to evaluate the contribution of the treated water prior to the distribution system to lead and copper levels measured in tap water. If the levels are excessive, as determined by the State, then a system may be required to install source water treatment, conduct follow-up monitoring, and continue to monitor source water lead and copper contributions to determine compliance with the State-specified maximum permissible source water levels. Those systems that were not required to install source water treatment should follow the reduced source water monitoring schedule. Confirmation samples, if taken within 14 days of the initial sample, are allowed when a maximum permissible source water level is exceeded. The results of the two samples are arranged for compliance with the maximum permissible source water levels. Samples are to be collected from each entry point to the distribution system as discussed in Section 4.3.

In addition to lead and copper monitoring, monitoring for water quality parameters at the entry point(s) to the distribution system is mandatory for PWSs required to install treatment. Biweekly monitoring at each entry point to the distribution system must be performed to demonstrate that the State-specified water quality parameter ranges are met.

4.5 — Data Analysis and Interpretation

The monitoring results are used to: (1) determine whether the lead and/or copper ALs are exceeded; (2) for those systems required to install treatment: (a) verify performance with approved operational conditions; (b) verify that the distribution system pH or other water quality parameter levels meet the minimum requirements when corrosion control is required; and (3) determine which LSLs must be replaced if a PWS is required to implement a LSL replacement program.

Additional analyses and results may be generated from the monitoring data collected under the Lead and Copper Rule so as to assess the behavior the distribution system with regards to water quality stability. This information could prove very useful to many utilities which are facing the challenges of maintaining high water quality throughout their service area.

Evaluating Lead and Copper ALs: In general, the concentration of lead and copper in consumers' tap water exhibits a log-normal distribution. Therefore, the interpretation of the monitoring results must consider the skewed nature of typical results. If a frequency distribution of lead and copper levels found from tap monitoring were to be developed, most systems would find a large number of samples with low concentrations. Some systems might find that they also experience extremely high concentrations of lead, but only at a limited number of sites and the behavior of the high lead

levels is inconsistent. The nature, then, of lead and copper monitoring results does not lend itself to the typical data analyses used by utilities.

Therefore, the average or mean concentration is not a very useful measurement of the behavior of lead and copper levels experienced in the distribution system because it can be overly influenced by a large number of low concentrations as well as a few number of extremely high concentrations. For an average value to be meaningful, the data being analyzed must exhibit a normal distribution of values.

For this reason, distribution frequency or the percent of samples below or above a specified value proves most useful in analyzing lead and copper data. This is the basis for the ALs being based on a certain frequency of samples which have lead and copper levels less than 0.015 mg/L and 1.3 mg/L, respectively.

Action levels are exceeded if the "90th percentile" value is greater than 0.015 mg/L for lead and 1.3 mg/L for copper. To determine whether the monitoring results meet the action levels stipulated for lead and copper, list the collected data from the highest value recorded to the lowest value recorded. The 90th percentile values for lead and copper can be determined by multiplying the number of samples taken by 0.9. This number is the position of the 90th percentile value. Starting from the bottom (lowest value) count up until the calculated number (0.9 x # samples) is reached. The sample value in this number position is the 90th percentile value. Table 4-5 has been composed to simplify this process. The 90th percentile values for lead and copper can be determined by moving down the listed values the number of positions indicated in Table 4-5 for each water system size.

Example: A system size of 8,000 collects samples from 40 sites. Those sites are listed from the highest value to the lowest. From Table 4-5, for a system size of 8,000, the value in the fifth position from the top of the list is the 90th percentile value. If these values were numbered from the bottom up, this would be the 36th value.

To calculate the 90th percentile value without the table, simply multiply the number of samples taken by 0.9, 0.9 x 40 samples = 36. Count up from the bottom to the 36th value. This is the 90th percentile value, (5th from the top).

Interpolation of lead and copper levels may be necessary in some cases to determine system performance at the desired frequency. If the 90th percentile value is represented by a sample position other than an integer, (e.g. 0.9 x # samples = 17.3), then the 90th percentile value must be found by interpolating the results of the lower and higher samples (e.g., the 17th and 18th results in this case). The rounding convention to be used when interpolating between two analytical results is as follows: all results greater than or equal to 0.5 units round to the next unit, and results less than 0.5 units round down.

Example: A system serving 100 people that collects 5 samples as required during initial monitoring will calculate

Table 4-5. Determination of 90th Percentile Values for Lead and Copper Monitoring Results

System Size	Minimum No. Samples Required		90% Value Position from Bottom of List	
	Initial, Follow-Up and Routine Monitoring	Reduced Monitoring	Initial, Follow-Up, and Routine Monitoring	Reduced Monitoring
Large PWSs				
>100,000	100	50	90	45
50,001—100,000	60	30	54	27
Medium PWSs				
10,001—50,000	60	30	54	27
3,301—10,000	40	20	36	18
Small PWSs				
501—3,300	20	10	18	9
100—500	10	5	9	Avg 4 & 5
≤100	5	5	Avg 4 & 5	Avg 4 & 5

the 90th percentile concentration for lead by averaging the values in the two highest values. Monitoring results for the small PWS are stacked from highest to lowest value below. The 90th percentile value is found by multiplying the number of samples taken, in this case 5, by 0.9 to estimate its location in the list. Since this is 4.5, the 90% lead level is the average of the lead results for samples 4 and 5, or 0.016 mg/L which exceeds the lead AL.

Sample Number	Sample Result
5	0.019
4	0.013
3	0.007
2	0.005
1	0.001

If additional frequency determinations are desired, several software packages are available which can generate this information. Data stored in spreadsheet format is easily evaluated either using a similar technique to that described above, or else, by the software capabilities.

Water Quality Parameters: The water quality parameter data, including pH data, collected from distribution system monitoring should be organized and stored in a permanent data file by sampling location so that they can be directly compared with lead and copper results from nearby locations. The average, maximum and minimum values found for each water quality parameter should be determined for each site over time as well as for the distribution system overall for each monitoring period.

Storing water quality data on a computer database would be extremely helpful and efficient for large and medium PWSs. Spreadsheet and/or database management software would be useful, particularly those having statistical analysis capabilities. If the water quality data is stored on a computer database, then long-term trend analysis of the water quality data could be performed. Such an analysis might include an assessment of the relative changes in water quality parameters before and after treatment modifications; changes experienced between segments of the service area; and, the relationship between source water quality and distribution system water quality in terms of the stability of water quality parameters within the service area.

4.6 — State Implementation of Monitoring Requirements

Table 4-6 presents the timetable for each monitoring step required by system size, and the action required by the State in response to the monitoring program results. This table should serve as a management tool for State programs in order to permit the scheduling of advance notices, State determinations, laboratory certification program needs, and State-run laboratory sample loading requirements. Many State laboratories are the only laboratories certified for compliance monitoring purposes, and so the entire lead and copper analytical burden will fall to them for timely completion. This may place an extraordinary burden on certain States, and should be addressed

Table 4-6. State Corrosion Control Implementation Actions and Timeframes

System Size	PWS Implementation Step	Date	State Response and Timeframe
Large PWSs	Material Survey and Sampling Plan Completed — Tier 1	01/01/92	No Action
	Insufficient Number of LSLs — Tier 2	01/01/92	State Approval of Sampling Plan
	or Tier 3	01/01/92	State Approval of Sampling Plan
	Initial Monitoring Begins	01/01/92	No Action
	Initial Monitoring Results Submitted to the State		Review/Inform PWSs Required to Perform Public Education if
	First 6 months	07/11/92	Lead AL Exceeded
	Second 6 months	01/11/93	
	Corrosion Study Results Submitted to the State	07/01/94	Review
	PWS Recommends Optimal Treatment to the State	07/01/94	Approve/Designate Treatment 01/01/95
	PWS Installs Treatment by	01/01/97	No Action
	Follow-up Monitoring Begins	01/01/97	No Action
	Follow-up Monitoring Results Submitted to the State		Review/Set Water Quality Parameter Ranges 07/01/98
	First 6 months	07/11/97	Inform PWSs Required to
	Second 6 months	01/11/98	Perform Public Education if Lead AL Exceeded LSLRP Determination
	Routine Monitoring Begins	07/01/98	No Action
	Routine Monitoring Results Submitted to the State		Inform PWSs Required to Perform Public Education if
	First 6 months	01/11/99	Lead AL Exceeded/Water
	Second 6 months	07/11/99	Quality Parameter Compliance

Table 4-6. State Implementation Actions and Timeframes (Continued)

System Size	PWS Implementation Step	Date	State Response and Timeframe
Medium PWSs	Material Survey and Sampling Plan Completed — Tier 1	07/01/92	No Action
	Insufficient Number of LSLs — Tier 2 or Tier 3	07/01/92 07/01/92	State Approval of Sampling Plan State Approval of Sampling Plan
	Initial Monitoring Begins	07/01/92	No Action
	Initial Monitoring Results Submitted to the State First 6 months If required, Second 6 months	 01/11/93 07/11/93	Review/Inform PWSs Required to Perform Public Education if Lead AL Exceeded
	PWS Recommends Optimal Treatment to the State	6 months After >AL	Approve/Designate Treatment either 18 months after >AL OR 6 months after corrosion study completed
	Corrosion Study Results Submitted to the State	18 months After State Designates	Review
	PWS Installs Treatment by	24 months After State Designates	No Action
	Follow-up Monitoring Begins	Immediately After Treatment Installed	No Action
	Follow-up Monitoring Results Submitted to the State First 6 months Second 6 months	 6 months After Treatment 12 months After Treatment	Review/Set Water Quality Parameter Ranges within 6 months/Inform PWSs Required to Perform Public Education if Lead AL Exceeded/LSLR Determination
	Routine Monitoring Begins	18 months After Treatment Installed	No Action
	Routine Monitoring Results Submitted to the State First 6 months Second 6 months	 24 months After Treatment 30 months After Treatment	Inform PWSs Required to Perform Public Education if Lead AL Exceeded/Water Quality Parameter Compliance

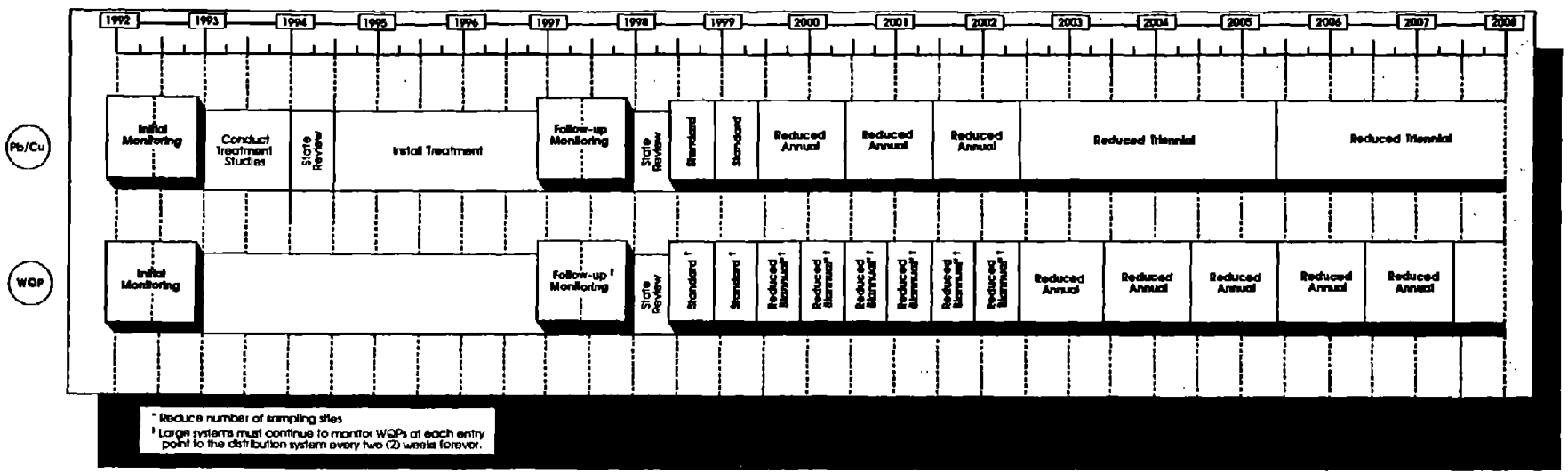
Table 4-6. State Implementation Actions and Timeframes (Continued)

System Size	PWS Implementation Step	Date	State Response and Timeframe
Small PWSs	Material Survey and Sampling Plan Completed — Tier 1	07/01/93	No Action
	Insufficient Number of LSLs — Tier 2 or Tier 3	07/01/93 07/01/93	State Approval of Sampling Plan State Approval of Sampling Plan
	Initial Monitoring Begins	07/01/93	No Action
	Initial Monitoring Results Submitted to the State First 6 months If required, Second 6 months	 01/01/94 07/01/94	Review/Inform PWSs Required to Perform Public Education if Lead AL Exceeded
	PWS Recommends Optimal Treatment to the State	6 months After >AL	Approve/Designate Treatment either 18 months after >AL OR 6 months after corrosion study completed
	Corrosion Study Results Submitted to the State	18 months After State Designates	Review
	PWS Installs Treatment by	24 months After State Designates	No Action
	Follow-up Monitoring Begins	Immediately After Treatment Installed	No Action
	Follow-up Monitoring Results Submitted to the State First 6 months Second 6 months	 6 months After Treatment 12 months After Treatment	Review/Set Water Quality Parameter Ranges within 6 months/Inform PWSs Required to Perform Public Education if Lead AL Exceeded/LSLR Determination
	Routine Monitoring Begins	18 months After Treatment Installed	No Action
	Routine Monitoring Results Submitted to the State First 6 months Second 6 months	 24 months After Treatment 30 months After Treatment	Inform PWSs Required to Perform Public Education if Lead AL Exceeded/Water Quality Parameter Compliance

in advance should alternative laboratory services be required.

In addition, implementation of the monitoring program will need to be supported by data management services within State agencies. The information needed to fully manage compliance with the monitoring provisions include: (1) complete identification of all sample sites (tap, distribution system, and entry points) for each PWS as provided in the submitted sample plan; (2) identification of the deadlines for receiving sampling results for each step in the implementation pathway; (3) when treatment is recommended, the type of treatment approved by the State and the operating parameter requirements for compliance; and, (4) verification that samples were collected in accordance with the prescribed procedures.

Tap Water Monitoring Requirements For Large Water Systems (>100,000)



INITIAL MONITORING REQUIREMENTS FOR SYSTEMS SERVING >100,000 PERSONS

1992

FIRST MONITORING PERIOD — *January 1, 1992 to July 1, 1992*
SECOND MONITORING PERIOD — *July 1, 1992 to January 1, 1993*

LEAD AND COPPER TAP WATER SAMPLING

✦ **COLLECTION METHODS NEVER CHANGE**
- One liter
- First draw
- 6-hour standing time

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 100 sites during each of 2 consecutive 6-month monitoring periods

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **WQP SAMPLES COLLECTED AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM AND AT EACH ENTRY POINT**
- pH
- Alkalinity
- Calcium
- Conductivity
- Temperature
- Orthophosphate, when phosphate-based inhibitor used
- Silica, when silicate-based inhibitor used

✦ **NUMBER OF WQP SAMPLES COLLECTED AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- 2 samples at 25 sites during each of 2 consecutive 6-month monitoring periods

✦ **NUMBER OF WQP SAMPLES COLLECTED AT EACH ENTRY POINT**
- 2 samples at each entry point during each of 2 consecutive 6-month monitoring periods

MONITORING PERIODS

✦ **FIRST MONITORING PERIOD**
- January 1, 1992 to July 1, 1992 (submit by July 11, 1992)

✦ **SECOND MONITORING PERIOD**
- July 1, 1992 to January 1, 1993 (submit by January 11, 1993)

FOLLOW-UP MONITORING REQUIREMENTS FOR SYSTEMS SERVING >100,000 PERSONS

1997

FIRST MONITORING PERIOD — *January 1, 1997 to July 1, 1997*
SECOND MONITORING PERIOD — *July 1, 1997 to January 1, 1998*

LEAD AND COPPER TAP WATER SAMPLING

- **NUMBER AND FREQUENCY OF SAMPLING**
  - 1 sample at 100 sites during each of 2 consecutive 6-month monitoring periods

WATER QUALITY PARAMETER (WQP) SAMPLING

- **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
  - PARAMETERS SAMPLED
    - pH
    - Alkalinity
    - Calcium, when calcium carbonate stabilization used
    - Orthophosphate, when phosphate-based inhibitor used
    - Silica, when silicate-based inhibitor used
  - NUMBER AND FREQUENCY OF SAMPLING
    - 2 samples at 25 sites during each of 2 consecutive 6-month monitoring periods

- **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
  - PARAMETERS SAMPLED
    - pH
    - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
    - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
  - NUMBER AND FREQUENCY OF SAMPLING
    - 1 sample at each entry point every 2 weeks

MONITORING PERIODS

- **FIRST MONITORING PERIOD**
  - January 1, 1997 to July 1, 1997 (submit by July 11, 1997)

- **SECOND MONITORING PERIOD**
  - July 1, 1997 to January 1, 1998 (submit by January 11, 1998)

STATE REVIEWS RESULTS OF FOLLOW-UP SAMPLES

1998

January 1, 1998 to July 1, 1998

STATE ESTABLISHES WQPs

- **State establishes WQP values for representative points in the distribution system:**
  - pH level
  - Alkalinity concentration, when alkalinity adjusted
  - Calcium concentration, when calcium adjusted
  - Orthophosphate concentration, when a phosphate-based inhibitor is used
  - Silica concentration, when a silicate-based inhibitor is used
- **State establishes chemical dosage rates measured at entry points to the distribution system:**
  - Chemical used to adjust pH, when pH adjusted
  - Dosage rate of the chemical used to adjust alkalinity, when alkalinity adjusted
  - Dosage rate of chemical used to adjust calcium, when calcium adjusted
  - Dosage rate of inhibitor used, when inhibitor used

STATE REVIEW PERIOD

- **State must establish WQP values that must be met at sampling sites in the distribution system and chemical dosages that must be maintained at each entry point to the distribution system**
- **State must inform the system of these WQP values in writing by July 1, 1998**

MONITORING REQUIREMENTS FOR SYSTEMS SERVING >100,000 PERSONS AFTER STATE ESTABLISHES WQPs

1998

FIRST MONITORING PERIOD — *July 1, 1998 to January 1, 1999*
SECOND MONITORING PERIOD — *January 1, 1999 to July 1, 1999*

LEAD AND COPPER TAP WATER SAMPLING

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 100 sites every 6 months

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 25 sites every 6 months

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

MONITORING PERIODS

✦ **FIRST MONITORING PERIOD**
- July 1, 1998 to January 1, 1999 (submit by January 11, 1999)

✦ **SECOND MONITORING PERIOD**
- January 1, 1999 to July 1, 1999 (submit by July 11, 1999)

REDUCED MONITORING REQUIREMENTS FOR SYSTEMS SERVING >100,000 PERSONS

1999

Beginning July 1, 1999

✦ System maintaining values for WQPs at representative sites in the distribution system for 2 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 1 year, may reduce sampling as follows:

LEAD AND COPPER TAP WATER SAMPLING

✦ NUMBER AND FREQUENCY OF SAMPLING
- 1 sample at 50 sites annually

✦ REQUESTING REDUCED SAMPLING
- System must submit written request asking the state to reduce the number and frequency of lead and copper tap water sampling (see form on page A-102)
- State must review lead and copper data submitted by the system and provide a written response

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 10 sites every 6 months

✦ AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

REDUCED MONITORING PERIODS

- **Lead and Copper Must Be Sampled Annually**
  - July 1, 2000 (submit by July 11, 2000)
  - July 1, 2001 (submit by July 11, 2001)
  - July 1, 2002 (submit by July 11, 2002)

- **WQPs Must Be Sampled at Representative Sites in the Distribution System Every 6 Months**
  - January 1, 2000 (submit by January 11, 2000)
  - July 1, 2000 (submit by July 11, 2000)
  - January 1, 2001 (submit by January 11, 2001)
  - July 1, 2001 (submit by July 11, 2001)
  - January 1, 2002 (submit by January 11, 2002)
  - July 1, 2002 (submit by July 11, 2002)

- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

REDUCED MONITORING REQUIREMENTS FOR SYSTEMS SERVING >100,000 PERSONS

2002

Beginning July 1, 2002

✦ System maintaining values for WQPs at representative sites in the distribution system for 6 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 3 years, may reduce sampling as follows:

LEAD AND COPPER TAP WATER SAMPLING

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 50 sites every 3 years

✦ **REQUESTING REDUCED SAMPLING**
- System must submit written request asking the state to reduce the number and frequency of lead and copper tap water sampling (see form on page A-102)
- State must review lead and copper data submitted by the system and provide a written response

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 10 sites every 6 months

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

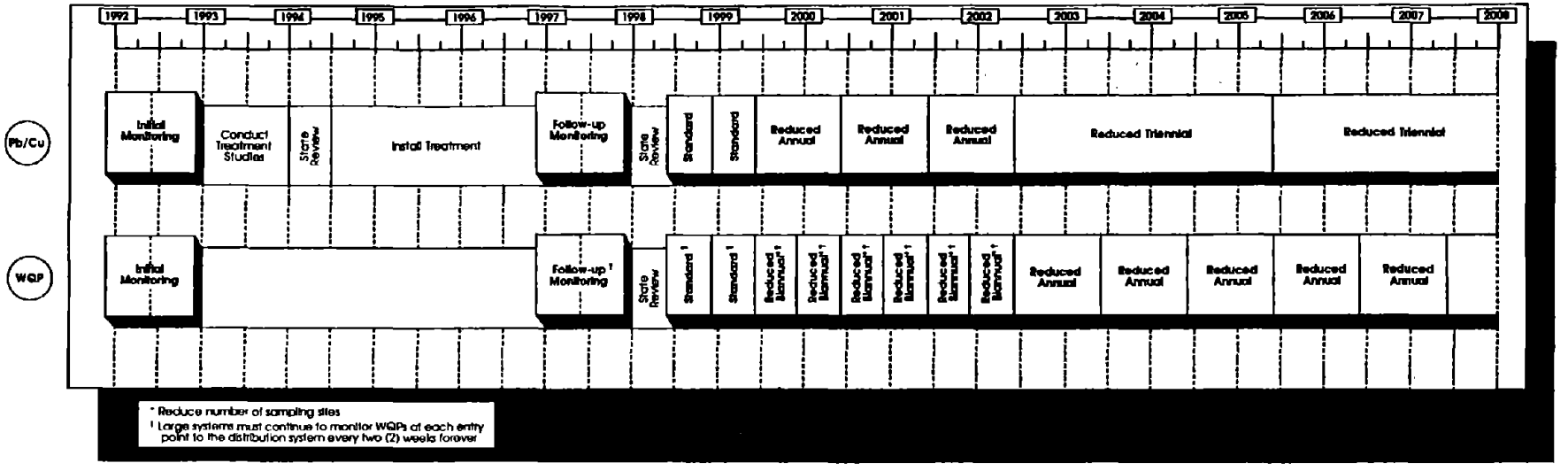
REDUCED MONITORING PERIODS

- **Lead and Copper Must Be Sampled Every 3 Years**
  - July 1, 2005 (submit by July 11, 2005)
  - July 1, 2008 (submit by July 11, 2008)
  - July 1, 2011 (submit by July 11, 2011)
  - Every 3 years thereafter

- **WQPs Must Be Sampled at Representative Sites in the Distribution System Annually**
  - July 1, 2003 (submit by July 11, 2003)
  - July 1, 2004 (submit by July 11, 2004)
  - July 1, 2005 (submit by July 11, 2005)
  - Annually thereafter

- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

Tap Water Monitoring Requirements For Large Water Systems (50,001 to 100,000)



INITIAL MONITORING REQUIREMENTS FOR SYSTEMS SERVING 50,001 TO 100,000 PERSONS

1992

FIRST MONITORING PERIOD — *January 1, 1992 to July 1, 1992*
SECOND MONITORING PERIOD — *July 1, 1992 to January 1, 1993*

LEAD AND COPPER TAP WATER SAMPLING

✦ **COLLECTION METHODS NEVER CHANGE**
- One liter
- First draw
- 6-hour standing time

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 60 sites during each of 2 consecutive 6-month monitoring periods

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **WQP SAMPLES COLLECTED AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM AND AT EACH ENTRY POINT**
- pH
- Alkalinity
- Calcium
- Conductivity
- Temperature
- Orthophosphate, when phosphate-based inhibitor used
- Silica, when silicate-based inhibitor used

✦ **NUMBER OF WQP SAMPLES COLLECTED AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- 2 samples at 10 sites during each of 2 consecutive 2-month monitoring periods

✦ **NUMBER OF WQP SAMPLES COLLECTED AT EACH ENTRY POINT**
- 2 samples at each entry point during each of 2 consecutive 6-month monitoring periods

MONITORING PERIODS

✦ **FIRST MONITORING PERIOD**
- January 1, 1992 to July 1, 1992 (submit by July 11, 1992)

✦ **SECOND MONITORING PERIOD**
- July 1, 1992 to January 1, 1993 (submit by January 11, 1993)

FOLLOW-UP MONITORING REQUIREMENTS FOR SYSTEMS SERVING 50,001 TO 100,000 PERSONS

1997

FIRST MONITORING PERIOD — *January 1, 1997 to July 1, 1997*
SECOND MONITORING PERIOD — *July 1, 1997 to January 1, 1998*

LEAD AND COPPER TAP WATER SAMPLING

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 60 sites during each of 2 consecutive 6-month monitoring periods

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 10 sites during each of 2 consecutive 6-month monitoring periods

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

MONITORING PERIODS

✦ **FIRST MONITORING PERIOD**
- January 1, 1997 to July 1, 1997 (submit by July 11, 1997)

✦ **SECOND MONITORING PERIOD**
- July 1, 1997 to January 1, 1998 (submit by January 11, 1998)

STATE REVIEWS RESULTS OF FOLLOW-UP SAMPLES

1998

January 1, 1998 to July 1, 1998

STATE ESTABLISHES WQPs

- **State establishes WQP values for representative points in the distribution system:**
  - pH level
  - Alkalinity concentration, when alkalinity adjusted
  - Calcium concentration, when calcium adjusted
  - Orthophosphate concentration, when a phosphate-based inhibitor is used
  - Silica concentration, when a silicate-based inhibitor is used
- **State establishes chemical dosage rates measured at entry points to the distribution system:**
  - Chemical used to adjust pH, when pH adjusted
  - Dosage rate of the chemical used to adjust alkalinity, when alkalinity adjusted
  - Dosage rate of chemical used to adjust calcium, when calcium adjusted
  - Dosage rate of inhibitor used, when inhibitor used

STATE REVIEW PERIOD

- **State must establish WQP values that must be met at sampling sites in the distribution system and chemical dosages that must be maintained at each entry point to the distribution system**
- **State must inform the system of these WQP values in writing by July 1, 1998**

MONITORING REQUIREMENTS FOR SYSTEMS SERVING 50,001 TO 100,000 PERSONS AFTER STATE ESTABLISHES WQPs

1998

FIRST MONITORING PERIOD — *July 1, 1998 to January 1, 1999*
SECOND MONITORING PERIOD — *January 1, 1999 to July 1, 1999*

LEAD AND COPPER TAP WATER SAMPLING

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 60 sites every 6 months

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 10 sites every 6 months

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

MONITORING PERIODS

✦ **FIRST MONITORING PERIOD**
- July 1, 1998 to January 1, 1999 (submit by January 11, 1999)

✦ **SECOND MONITORING PERIOD**
- January 1, 1999 to July 1, 1999 (submit by July 11, 1999)

REDUCED MONITORING REQUIREMENTS FOR SYSTEMS SERVING 50,001 TO 100,000 PERSONS

1999

Beginning July 1, 1999

✦ System maintaining values for WQPs at representative sites in the distribution system for 2 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 1 year, may reduce sampling as follows:

LEAD AND COPPER TAP WATER SAMPLING

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 30 sites annually

✦ **REQUESTING REDUCED SAMPLING**
- System must submit written request asking the state to reduce the number and frequency of lead and copper tap water sampling (see form on page A-102)
- State must review lead and copper data submitted by the system and provide a written response

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 7 sites every 6 months

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

REDUCED MONITORING PERIODS

- **Lead and Copper Must Be Sampled Annually**
  - July 1, 2000 (submit by July 11, 2000)
  - July 1, 2001 (submit by July 11, 2001)
  - July 1, 2002 (submit by July 11, 2002)

- **WQPs Must Be Sampled at Representative Sites in the Distribution System Every 6 Months**
  - January 1, 2000 (submit by January 11, 2000)
  - July 1, 2000 (submit by July 11, 2000)
  - January 1, 2001 (submit by January 11, 2001)
  - July 1, 2001 (submit by July 11, 2001)
  - January 1, 2002 (submit by January 11, 2002)
  - July 1, 2002 (submit by July 11, 2002)

- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

REDUCED MONITORING REQUIREMENTS FOR SYSTEMS SERVING 50,001 TO 100,000 PERSONS

Beginning July 1, 2002

✦ System maintaining values for WQPs at representative sites in the distribution system for 6 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 3 years, may reduce sampling as follows:

LEAD AND COPPER TAP WATER SAMPLING

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 30 sites every 3 years

✦ **REQUESTING REDUCED SAMPLING**
- System must submit written request asking the state to reduce the number and frequency of lead and copper tap water sampling (see form on page A-102)
- State must review lead and copper data submitted by the system and provide a written response

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 7 sites annually

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

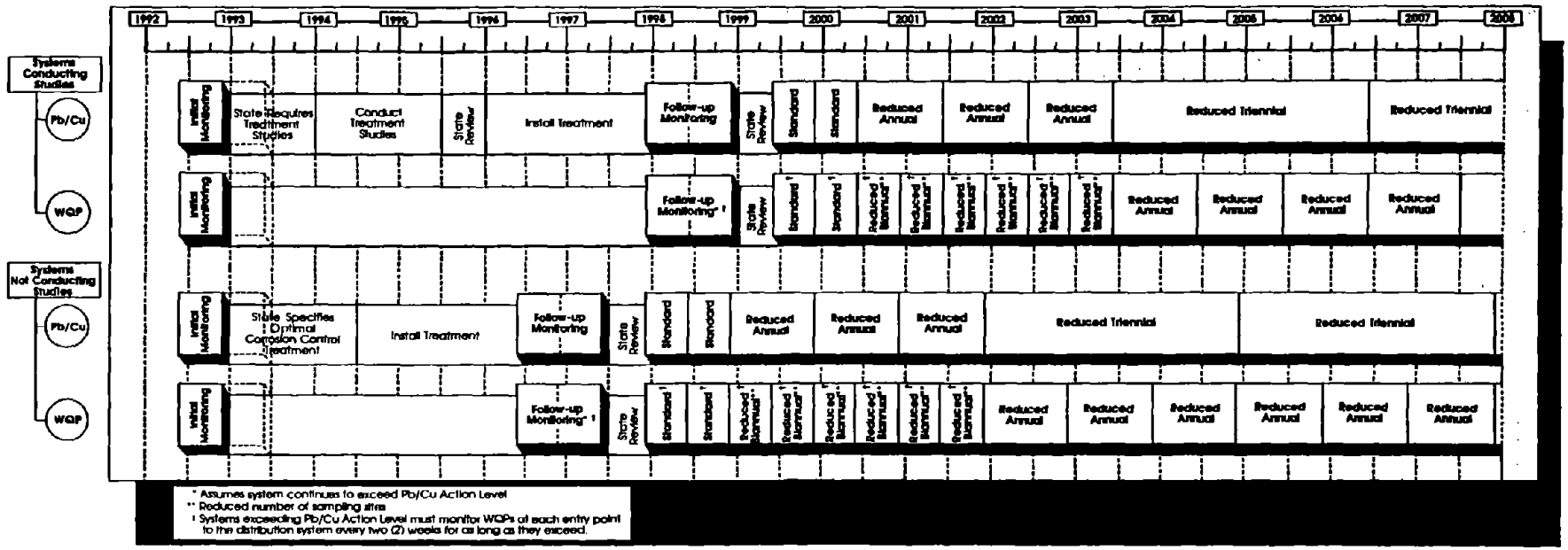
REDUCED MONITORING PERIODS

- **Lead and Copper Must Be Sampled Every 3 Years**
  - July 1, 2005 (submit by July 11, 2005)
  - July 1, 2008 (submit by July 11, 2008)
  - July 1, 2011 (submit by July 11, 2011)
  - Every 3 years thereafter

- **WQPs Must Be Sampled at Representative Sites in the Distribution System Annually**
  - July 1, 2003 (submit by July 11, 2003)
  - July 1, 2004 (submit by July 11, 2004)
  - July 1, 2005 (submit by July 11, 2005)
  - Annually thereafter

- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

Tap Water Monitoring Requirements For Medium Water Systems (10,001 to 50,000)



INITIAL MONITORING REQUIREMENTS FOR SYSTEMS SERVING 10,001 TO 50,000 PERSONS

1992

FIRST MONITORING PERIOD *July 1, 1992 to January 1, 1993*

✦ The schedule discussed in this section assumes the water system exceeds an action level in the first monitoring period. Systems meeting both action levels should see the monitoring schedule on page A-27 of this guidance.

LEAD AND COPPER TAP WATER SAMPLING

✦ **COLLECTION METHODS NEVER CHANGE**
- One liter
- First draw
- 6-hour standing time

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 60 sites every 6 months

✦ **ADDITIONAL SAMPLING**
- System exceeding an action level should consider collecting lead and copper samples during a second 6-month monitoring period to determine lead and copper tap water levels over the course of an entire year
- These samples should be submitted to the state with the treatment recommendation
- System should collect lead and copper samples early enough in the monitoring period to allow time to collect WQP samples

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **WQP SAMPLES COLLECTED AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM AND AT EACH ENTRY POINT**
- pH
- Alkalinity
- Calcium
- Conductivity
- Temperature
- Orthophosphate, when phosphate-based inhibitor used
- Silica, when silicate-based inhibitor used

✦ **NUMBER OF WQP SAMPLES COLLECTED AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- 2 samples at 10 sites during each 6-month monitoring period in which the system exceeds an action level

✦ **NUMBER OF WQP SAMPLES COLLECTED AT EACH ENTRY POINT**
- 2 samples at each entry point during each 6-month monitoring period in which the system exceeds an action level

✦ **ADDITIONAL SAMPLING**
- System exceeding an action level should consider collecting WQP samples during a second 6-month monitoring period to determine the effectiveness of corrosion control treatment over the course of an entire year
- These samples should be submitted to the state with the treatment recommendation

MONITORING PERIODS

- **FIRST MONITORING PERIOD**
  - July 1, 1992 to January 1, 1993 (submit by January 11, 1993)
- **SECOND MONITORING PERIOD (Recommended)**
  - January 1, 1993 to July 1, 1993 (submit with treatment recommendation)

FOLLOW-UP MONITORING REQUIREMENTS FOR SYSTEMS SERVING 10,001 TO 50,000 PERSONS

SYSTEMS NOT CONDUCTING STUDIES	*July 1, 1996 to January 1, 1997*
	January 1, 1997 to July 1, 1997
SYSTEMS CONDUCTING STUDIES	*January 1, 1998 to July 1, 1998*
	July 1, 1998 to January 1, 1999

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER

LEAD AND COPPER TAP WATER SAMPLING

- **NUMBER AND FREQUENCY OF SAMPLING**
  - 1 sample at 60 sites during each of 2 consecutive 6-month monitoring periods

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

- **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
  - PARAMETERS SAMPLED
    - pH
    - Alkalinity
    - Calcium, when calcium carbonate stabilization used
    - Orthophosphate, when phosphate-based inhibitor used
    - Silica, when silicate-based inhibitor used
  - NUMBER AND FREQUENCY OF SAMPLING
    - 2 samples at 10 sites during each of 2 consecutive 6-month monitoring periods

- **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
  - PARAMETERS SAMPLED
    - pH
    - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
    - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
  - NUMBER AND FREQUENCY OF SAMPLING
    - 1 sample at each entry point every 2 weeks

MONITORING PERIODS

- **SYSTEMS NOT CONDUCTING STUDIES**
  - FIRST MONITORING PERIOD
    - July 1, 1996 to January 1, 1997 (submit by January 11, 1997)
  - SECOND MONITORING PERIOD
    - January 1, 1997 to July 1, 1997 (submit by July 11, 1997)

- **SYSTEMS CONDUCTING STUDIES**
  - FIRST MONITORING PERIOD
    - January 1, 1998 to July 1, 1998 (submit by July 11, 1998)
  - SECOND MONITORING PERIOD
    - July 1, 1998 to January 1, 1999 (submit by January 11, 1999)

STATE REVIEWS RESULTS OF FOLLOW-UP SAMPLES

1997/1999

SYSTEMS NOT CONDUCTING STUDIES — *July 1, 1997 to January 1, 1998*
SYSTEMS CONDUCTING STUDIES — *January 1, 1999 to July 1, 1999*

STATE ESTABLISHES WQPs

- **State establishes WQP values or ranges for measurements for representative points in the distribution system:**
  - pH level
  - Alkalinity concentration, when alkalinity adjusted
  - Calcium concentration, when calcium adjusted
  - Orthophosphate concentration, when a phosphate-based inhibitor is used
  - Silica concentration, when a silicate-based inhibitor is used
- **State establishes chemical dosage rates measured at entry points to the distribution system:**
  - Chemical used to adjust pH, when pH adjusted
  - Chemical used to adjust alkalinity, when alkalinity adjusted
  - Chemical used to adjust calcium, when calcium adjusted
  - Dosage rate of inhibitor used, when inhibitor used

STATE REVIEW PERIOD

- **For systems not conducting studies:**
  - By January 1, 1998 states must establish WQP values that must be met at sampling sites in the distribution system, and chemical dosages that must be maintained at each entry point to the distribution system
- **For systems conducting studies:**
  - By July 1, 1999 states must establish WQP values that must be met at sampling sites in the distribution system, and chemical dosages that must be maintained at each entry point to the distribution system
- **State must inform each system of these WQP values in writing**

MONITORING REQUIREMENTS FOR SYSTEMS SERVING 10,001 TO 50,000 PERSONS AFTER STATE ESTABLISHES WQPs

SYSTEMS NOT CONDUCTING STUDIES	***January 1, 1998 to July 1, 1998***
	July 1, 1998 to January 1, 1999
SYSTEMS CONDUCTING STUDIES	***July 1, 1999 to January 1, 2000***
	January 1, 2000 to July 1, 2000

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER

LEAD AND COPPER TAP WATER SAMPLING

- **NUMBER AND FREQUENCY OF SAMPLING**
  - 1 sample at 60 sites every 6 months

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

- **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
  - PARAMETERS SAMPLED
    - pH
    - Alkalinity
    - Calcium, when calcium carbonate stabilization used
    - Orthophosphate, when phosphate-based inhibitor used
    - Silica, when silicate-based inhibitor used
  - NUMBER AND FREQUENCY OF SAMPLING
    - 2 samples at 10 sites every 6 months

- **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
  - PARAMETERS SAMPLED
    - pH
    - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
    - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
  - NUMBER AND FREQUENCY OF SAMPLING
    - 1 sample at each entry point every 2 weeks

MONITORING PERIODS

✦ **SYSTEMS NOT CONDUCTING STUDIES**

- FIRST MONITORING PERIOD
  - January 1, 1998 to July 1, 1998 (submit by July 11, 1998)
- SECOND MONITORING PERIOD
  - July 1, 1998 to January 1, 1999 (submit by January 11, 1999)

✦ **SYSTEMS CONDUCTING STUDIES**

- FIRST MONITORING PERIOD
  - July 1, 1999 to January 1, 2000 (submit by January 11, 2000)
- SECOND MONITORING PERIOD
  - January 1, 2000 to July 1, 2000 (submit by July 11, 2000)

REDUCED MONITORING REQUIREMENTS FOR SYSTEMS SERVING 10,001 TO 50,000 PERSONS

SYSTEMS NOT CONDUCTING STUDIES ***Beginning January 1, 1999***
SYSTEMS CONDUCTING STUDIES ***Beginning July 1, 2000***

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER AND MAY REDUCE MONITORING AS FOLLOWS:

LEAD AND COPPER TAP WATER SAMPLING

✦ **System exceeding an action level, but maintaining values for WQPs at representative sites in the distribution system for 2 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 1 year, may reduce lead and copper tap water sampling as follows:**

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 30 sites annually

✦ **REQUESTING REDUCED SAMPLING**
- System must submit written request asking the state to reduce the number and frequency of lead and copper tap water sampling (see form on page A-102)
- State must review lead and copper data submitted by the system and provide a written response

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **System maintaining values for WQPs at representative sites in the distribution system for 2 consecutive 6-month monitoring periods, and at each entry point to the distribution system for one year, may reduce WQP sampling as follows:**

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 7 sites every 6 months

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

REDUCED MONITORING PERIODS

✦ **SYSTEMS NOT CONDUCTING STUDIES**

- **Lead and Copper Must Be Sampled Annually**
  - January 1, 2000 (submit by January 11, 2000)
  - January 1, 2001 (submit by January 11, 2001)
  - January 1, 2002 (submit by January 11, 2002)
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Every 6 Months**
  - July 1, 1999 (submit by July 11, 1999)
  - January 1, 2000 (submit by January 11, 2000)
  - July 1, 2000 (submit by July 11, 2000)
  - January 1, 2001 (submit by January 11, 2001)
  - July 1, 2001 (submit by July 11, 2001)
  - January 1, 2002 (submit by January 11, 2002)
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

✦ **SYSTEMS CONDUCTING STUDIES**

- **Lead and Copper Must Be Sampled Annually**
  - July 1, 2001 (submit by July 11, 2001)
  - July 1, 2002 (submit by July 11, 2002)
  - July 1, 2003 (submit by July 11, 2003)
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Every 6 Months**
  - January 1, 2001 (submit by January 11, 2001)
  - July 1, 2001 (submit by July 11, 2001)
  - January 1, 2002 (submit by January 11, 2002)
  - July 1, 2002 (submit by July 11, 2002)
  - January 1, 2003 (submit by January 11, 2003)
  - July 1, 2003 (submit by July 11, 2003)
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

REDUCED MONITORING REQUIREMENTS FOR SYSTEMS SERVING 10,001 TO 50,000 PERSONS

SYSTEMS NOT CONDUCTING STUDIES ***Beginning January 1, 2002***
SYSTEMS CONDUCTING STUDIES ***Beginning July 1, 2003***

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER AND MAY REDUCE MONITORING AS FOLLOWS:

LEAD AND COPPER TAP WATER SAMPLING

✦ **System exceeding an action level, but maintaining values for WQPs at representative sites in the distribution system for 6 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 3 years, may reduce lead and copper tap water sampling as follows:**

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 30 sites every 3 years

✦ **REQUESTING REDUCED SAMPLING**
- System must submit written request asking the state to reduce the number and frequency of lead and copper tap water sampling (see form on page A-102)
- State must review lead and copper data submitted by the system and provide a written response

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **System maintaining values for WQPs at representative sites in the distribution system for 6 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 3 years, may reduce WQP sampling as follows:**

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 7 sites annually

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

REDUCED MONITORING PERIODS

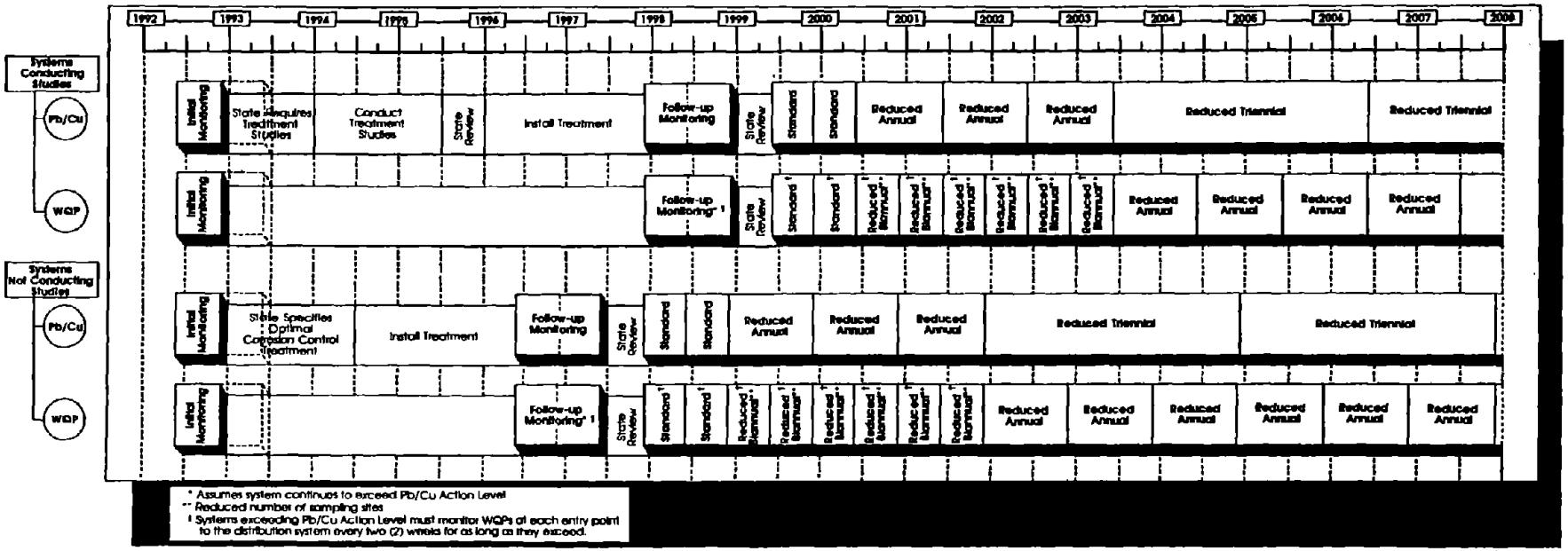
✦ SYSTEMS NOT CONDUCTING STUDIES

- **Lead and Copper Must Be Sampled Every 3 Years**
  - January 1, 2005 (submit by January 11, 2005)
  - January 1, 2008 (submit by January 11, 2008)
  - January 1, 2011 (submit by January 11, 2011)
  - Every 3 years thereafter
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Annually**
  - January 1, 2003 (submit by January 11, 2003)
  - January 1, 2004 (submit by January 11, 2004)
  - January 1, 2005 (submit by January 11, 2005)
  - Annually thereafter
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

✦ SYSTEMS CONDUCTING STUDIES

- **Lead and Copper Must Be Sampled Every 3 Years**
  - July 1, 2006 (submit by July 11, 2006)
  - July 1, 2009 (submit by July 11, 2009)
  - July 1, 2012 (submit by July 11, 2012)
  - Every 3 years thereafter
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Annually**
  - July 1, 2004 (submit by July 11, 2004)
  - July 1, 2005 (submit by July 11, 2005)
  - July 1, 2006 (submit by July 11, 2006)
  - Annually thereafter
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

Tap Water Monitoring Requirements For Medium Water Systems (3,301 to 10,000)



INITIAL MONITORING REQUIREMENTS FOR SYSTEMS SERVING 3,301 TO 10,000 PERSONS

1992

FIRST MONITORING PERIOD *July 1, 1992 to January 1, 1993*

✦ The schedule discussed in this section assumes the water system exceeds an action level in the first monitoring period. Systems meeting both action levels should see the monitoring schedule on page A-39 of this guidance.

LEAD AND COPPER TAP WATER SAMPLING

✦ **COLLECTION METHODS NEVER CHANGE**
- One liter
- First draw
- 6-hour standing time

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 40 sites every 6 months

✦ **ADDITIONAL SAMPLING**
- System exceeding an action level should consider collecting lead and copper samples during a second 6-month monitoring period to determine lead and copper tap water levels over the course of an entire year
- These samples should be submitted to the state with the treatment recommendation
- System should collect lead and copper samples early enough in the monitoring period to allow time to collect WQP samples

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **WQP SAMPLES COLLECTED AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM AND AT EACH ENTRY POINT**
- pH
- Alkalinity
- Calcium
- Conductivity
- Temperature
- Orthophosphate, when phosphate-based inhibitor used
- Silica, when silicate-based inhibitor used

✦ **NUMBER OF WQP SAMPLES COLLECTED AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- 2 samples at 3 sites during each 6-month monitoring period in which the system exceeds an action level

✦ **NUMBER OF WQP SAMPLES COLLECTED AT EACH ENTRY POINT**
- 2 samples at each entry point during each 6-month monitoring period in which the system exceeds an action level

✦ **ADDITIONAL SAMPLING**
- System exceeding an action level should consider collecting WQP samples during a second 6-month monitoring period to determine the effectiveness of corrosion control treatment over the course of an entire year
- These samples should be submitted to the state with the treatment recommendation

MONITORING PERIODS

- **FIRST MONITORING PERIOD**
  - July 1, 1992 to January 1, 1993 (submit by January 11, 1993)
- **SECOND MONITORING PERIOD (Recommended)**
  - January 1, 1993 to July 1, 1993 (submit with treatment recommendation)

FOLLOW-UP MONITORING REQUIREMENTS FOR SYSTEMS SERVING 3,301 TO 10,000 PERSONS

SYSTEMS NOT CONDUCTING STUDIES	***July 1, 1996 to January 1, 1997***
	January 1, 1997 to July 1, 1997
SYSTEMS CONDUCTING STUDIES	***January 1, 1998 to July 1, 1998***
	July 1, 1998 to January 1, 1999

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER

LEAD AND COPPER TAP WATER SAMPLING

- **NUMBER AND FREQUENCY OF SAMPLING**
  - 1 sample at 40 sites during each of 2 consecutive 6-month monitoring periods

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

- **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
  - PARAMETERS SAMPLED
    - pH
    - Alkalinity
    - Calcium, when calcium carbonate stabilization used
    - Orthophosphate, when phosphate-based inhibitor used
    - Silica, when silicate-based inhibitor used
  - NUMBER AND FREQUENCY OF SAMPLING
    - 2 samples at 3 sites during each of 2 consecutive 6-month monitoring periods

- **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
  - PARAMETERS SAMPLED
    - pH
    - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
    - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
  - NUMBER AND FREQUENCY OF SAMPLING
    - 1 sample at each entry point every 2 weeks

MONITORING PERIODS

✦ **SYSTEMS NOT CONDUCTING STUDIES**

- FIRST MONITORING PERIOD
  - July 1, 1996 to January 1, 1997 (submit by January 11, 1997)
- SECOND MONITORING PERIOD
  - January 1, 1997 to July 1, 1997 (submit by July 11, 1997)

✦ **SYSTEMS CONDUCTING STUDIES**

- FIRST MONITORING PERIOD
  - January 1, 1998 to July 1, 1998 (submit by July 11, 1998)
- SECOND MONITORING PERIOD
  - July 1, 1998 to January 1, 1999 (submit by January 11, 1999)

STATE REVIEWS RESULTS OF FOLLOW-UP SAMPLES

1997/1999

SYSTEMS NOT CONDUCTING STUDIES — *July 1, 1997 to January 1, 1998*
SYSTEMS CONDUCTING STUDIES — *January 1, 1999 to July 1, 1999*

STATE ESTABLISHES WQPs

- **State establishes WQP values or ranges for measurements for representative points in the distribution system:**
  - pH level
  - Alkalinity concentration, when alkalinity adjusted
  - Calcium concentration, when calcium adjusted
  - Orthophosphate concentration, when a phosphate-based inhibitor is used
  - Silica concentration, when a silicate-based inhibitor is used
- **State establishes chemical dosage rates measured at entry points to the distribution system:**
  - Chemical used to adjust pH, when pH adjusted
  - Chemical used to adjust alkalinity, when alkalinity adjusted
  - Chemical used to adjust calcium, when calcium adjusted
  - Dosage rate of inhibitor used, when inhibitor used

STATE REVIEW PERIOD

- **For systems not conducting studies:**
  - By January 1, 1998 states must establish WQP values that must be met at sampling sites in the distribution system, and chemical dosages that must be maintained at each entry point to the distribution system
- **For systems conducting studies:**
  - By July 1, 1999 states must establish WQP values that must be met at sampling sites in the distribution system, and chemical dosages that must be maintained at each entry point to the distribution system
- **State must inform each system of these WQP values in writing**

MONITORING REQUIREMENTS FOR SYSTEMS SERVING 3,301 TO 10,000 PERSONS AFTER STATE ESTABLISHES WQPs

SYSTEMS NOT CONDUCTING STUDIES	***January 1, 1998 to July 1, 1998***
	July 1, 1998 to January 1, 1999
SYSTEMS CONDUCTING STUDIES	***July 1, 1999 to January 1, 2000***
	January 1, 2000 to July 1, 2000

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER

LEAD AND COPPER TAP WATER SAMPLING

- **NUMBER AND FREQUENCY OF SAMPLING**
  - 1 sample at 40 sites every 6 months

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

- **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
  - PARAMETERS SAMPLED
    - pH
    - Alkalinity
    - Calcium, when calcium carbonate stabilization used
    - Orthophosphate, when phosphate-based inhibitor used
    - Silica, when silicate-based inhibitor used
  - NUMBER AND FREQUENCY OF SAMPLING
    - 2 samples at 3 sites every 6 months

- **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
  - PARAMETERS SAMPLED
    - pH
    - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
    - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
  - NUMBER AND FREQUENCY OF SAMPLING
    - 1 sample at each entry point every 2 weeks

MONITORING PERIODS

- **SYSTEMS NOT CONDUCTING STUDIES**
  - FIRST MONITORING PERIOD
    - January 1, 1998 to July 1, 1998 (submit by July 11, 1998)
  - SECOND MONITORING PERIOD
    - July 1, 1998 to January 1, 1999 (submit by January 11, 1999)

- **SYSTEMS CONDUCTING STUDIES**
  - FIRST MONITORING PERIOD
    - July 1, 1999 to January 1, 2000 (submit by January 11, 2000)
  - SECOND MONITORING PERIOD
    - January 1, 2000 to July 1, 2000 (submit by July 11, 2000)

REDUCED MONITORING REQUIREMENTS FOR SYSTEMS SERVING 3,301 TO 10,000 PERSONS

SYSTEMS NOT CONDUCTING STUDIES — ***Beginning January 1, 1999***
SYSTEMS CONDUCTING STUDIES — ***Beginning July 1, 2000***

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER AND MAY REDUCE MONITORING AS FOLLOWS:

LEAD AND COPPER TAP WATER SAMPLING

✦ **System exceeding an action level, but maintaining values for WQPs at representative sites in the distribution system for 2 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 1 year, may reduce lead and copper tap water sampling as follows:**

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 20 sites annually

✦ **REQUESTING REDUCED SAMPLING**
- System must submit written request asking the state to reduce the number and frequency of lead and copper tap water sampling (see form on page A-102)
- State must review lead and copper data submitted by the system and provide a written response

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **System maintaining values for WQPs at representative sites in the distribution system for 2 consecutive 6-month monitoring periods, and at each entry point to the distribution system for one year, may reduce WQP sampling as follows:**

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 3 sites every 6 months

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

REDUCED MONITORING PERIODS

✦ SYSTEMS NOT CONDUCTING STUDIES

- **Lead and Copper Must Be Sampled Annually**
  - January 1, 2000 (submit by January 11, 2000)
  - January 1, 2001 (submit by January 11, 2001)
  - January 1, 2002 (submit by January 11, 2002)
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Every 6 Months**
  - July 1, 1999 (submit by July 11, 1999)
  - January 1, 2000 (submit by January 11, 2000)
  - July 1, 2000 (submit by July 11, 2000)
  - January 1, 2001 (submit by January 11, 2001)
  - July 1, 2001 (submit by July 11, 2001)
  - January 1, 2002 (submit by January 11, 2002)
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

✦ SYSTEMS CONDUCTING STUDIES

- **Lead and Copper Must Be Sampled Annually**
  - July 1, 2001 (submit by July 11, 2001)
  - July 1, 2002 (submit by July 11, 2002)
  - July 1, 2003 (submit by July 11, 2003)
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Every 6 Months**
  - January 1, 2001 (submit by January 11, 2001)
  - July 1, 2001 (submit by July 11, 2001)
  - January 1, 2002 (submit by January 11, 2002)
  - July 1, 2002 (submit by July 11, 2002)
  - January 1, 2003 (submit by January 11, 2003)
  - July 1, 2003 (submit by July 11, 2003)
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

REDUCED MONITORING REQUIREMENTS FOR SYSTEMS SERVING 3,301 TO 10,000 PERSONS

SYSTEMS NOT CONDUCTING STUDIES — ***Beginning January 1, 2002***
SYSTEMS CONDUCTING STUDIES — ***Beginning July 1, 2003***

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER AND MAY REDUCE MONITORING AS FOLLOWS:

LEAD AND COPPER TAP WATER SAMPLING

✦ **System exceeding an action level, but maintaining values for WQPs at representative sites in the distribution system for 6 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 3 years, may reduce lead and copper tap water sampling as follows:**

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 20 sites every 3 years

✦ **REQUESTING REDUCED SAMPLING**
- System must submit written request asking the state to reduce the number and frequency of lead and copper tap water sampling (see form on page A-102)
- State must review lead and copper data submitted by the system and provide a written response

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **System maintaining values for WQPs at representative sites in the distribution system for 6 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 3 years, may reduce WQP sampling as follows:**

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 3 sites annually

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

REDUCED MONITORING PERIODS

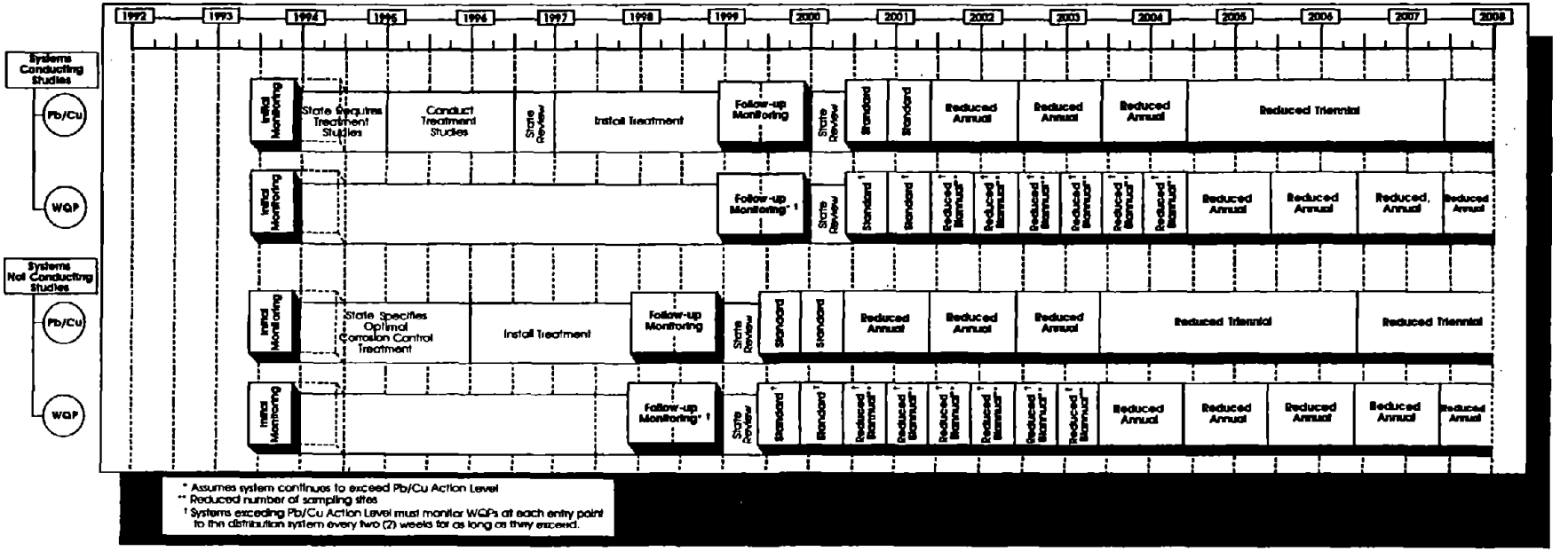
✦ SYSTEMS NOT CONDUCTING STUDIES

- **Lead and Copper Must Be Sampled Every 3 Years**
  - January 1, 2005 (submit by January 11, 2005)
  - January 1, 2008 (submit by January 11, 2008)
  - January 1, 2011 (submit by January 11, 2011)
  - Every 3 years thereafter
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Annually**
  - January 1, 2003 (submit by January 11, 2003)
  - January 1, 2004 (submit by January 11, 2004)
  - January 1, 2005 (submit by January 11, 2005)
  - Annually thereafter
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

✦ SYSTEMS CONDUCTING STUDIES

- **Lead and Copper Must Be Sampled Every 3 Years**
  - July 1, 2006 (submit by July 11, 2006)
  - July 1, 2009 (submit by July 11, 2009)
  - July 1, 2012 (submit by July 11, 2012)
  - Every 3 years thereafter
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Annually**
  - July 1, 2004 (submit by July 11, 2004)
  - July 1, 2005 (submit by July 11, 2005)
  - July 1, 2006 (submit by July 11, 2006)
  - Annually thereafter
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

Tap Water Monitoring Requirements For Small Water Systems (501 to 3,300)



INITIAL MONITORING REQUIREMENTS FOR SYSTEMS SERVING 501 TO 3,300 PERSONS

1993

FIRST MONITORING PERIOD *July 1, 1993 to January 1, 1994*

✦ The schedule discussed in this section assumes the water system exceeds an action level in the first monitoring period. Systems meeting both action levels should see the monitoring schedule on page A-51 of this guidance.

LEAD AND COPPER TAP WATER SAMPLING

✦ **COLLECTION METHODS NEVER CHANGE**
- One liter
- First draw
- 6-hour standing time

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 20 sites every 6 months

✦ **ADDITIONAL SAMPLING**
- System exceeding an action level should consider collecting lead and copper samples during a second 6-month monitoring period to determine lead and copper tap water levels over the course of an entire year
- These samples should be submitted to the state with the treatment recommendation
- System should collect lead and copper samples early enough in the monitoring period to allow time to collect WQP samples

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **WQP SAMPLES COLLECTED AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM AND AT EACH ENTRY POINT**
- pH
- Alkalinity
- Calcium
- Conductivity
- Temperature
- Orthophosphate, when phosphate-based inhibitor used
- Silica, when silicate-based inhibitor used

✦ **NUMBER OF WQP SAMPLES COLLECTED AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- 2 samples at 2 sites during each 6-month monitoring period in which the system exceeds an action level

✦ **NUMBER OF WQP SAMPLES COLLECTED AT EACH ENTRY POINT**
- 2 samples at each entry point during each 6-month monitoring period in which the system exceeds an action level

✦ **ADDITIONAL SAMPLING**
- System exceeding an action level should consider collecting WQP samples during a second 6-month monitoring period to determine the effectiveness of corrosion control treatment over the course of an entire year
- These samples should be submitted to the state with the treatment recommendation

MONITORING PERIODS

✦ **FIRST MONITORING PERIOD**
- July 1, 1993 to January 1, 1994 (submit by January 11, 1994)

✦ **SECOND MONITORING PERIOD (Recommended)**
- January 1, 1994 to July 1, 1994 (submit with treatment recommendation)

FOLLOW-UP MONITORING REQUIREMENTS FOR SYSTEMS SERVING 501 TO 3,300 PERSONS

SYSTEMS NOT CONDUCTING STUDIES	*January 1, 1998 to July 1, 1998*
	July 1, 1998 to January 1, 1999
SYSTEMS CONDUCTING STUDIES	*January 1, 1999 to July 1, 1999*
	July 1, 1999 to January 1, 2000

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER

LEAD AND COPPER TAP WATER SAMPLING

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 20 sites during each of 2 consecutive 6-month monitoring periods

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based innibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 2 sites during each of 2 consecutive 6-month monitoring periods

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

MONITORING PERIODS

- **SYSTEMS NOT CONDUCTING STUDIES**
  - FIRST MONITORING PERIOD
    - January 1, 1998 to July 1, 1998 (submit by July 11, 1998)
  - SECOND MONITORING PERIOD
    - July 1, 1998 to January 1, 1999 (submit by January 11, 1999)

- **SYSTEMS CONDUCTING STUDIES**
  - FIRST MONITORING PERIOD
    - January 1, 1999 to July 1, 1999 (submit by July 11, 1999)
  - SECOND MONITORING PERIOD
    - July 1, 1999 to January 1, 2000 (submit by January 11, 2000)

STATE REVIEWS RESULTS OF FOLLOW-UP SAMPLES

SYSTEMS NOT CONDUCTING STUDIES *January 1, 1999 to July 1, 1999*
SYSTEMS CONDUCTING STUDIES *January 1, 2000 to January 1, 2001*

STATE ESTABLISHES WQPs

- **State establishes WQP values or ranges for measurements for representative points in the distribution system:**
  - pH level
  - Alkalinity concentration, when alkalinity adjusted
  - Calcium concentration, when calcium adjusted
  - Orthophosphate concentration, when a phosphate-based inhibitor is used
  - Silica concentration, when a silicate-based inhibitor is used
- **State establishes chemical dosage rates measured at entry points to the distribution system:**
  - Chemical used to adjust pH, when pH adjusted
  - Chemical used to adjust alkalinity, when alkalinity adjusted
  - Chemical used to adjust calcium, when calcium adjusted
  - Dosage rate of inhibitor used, when inhibitor used

STATE REVIEW PERIOD

- **For systems not conducting studies:**
  - By July 1, 1999 states must establish WQP values that must be met at sampling sites in the distribution system, and chemical dosages that must be maintained at each entry point to the distribution system
- **For systems conducting studies:**
  - By January 1, 2001 states must establish WQP values that must be met at sampling sites in the distribution system, and chemical dosages that must be maintained at each entry point to the distribution system
- **State must inform each system of these WQP values in writing**

MONITORING REQUIREMENTS FOR SYSTEMS SERVING 501 TO 3,300 PERSONS AFTER STATE ESTABLISHES WQPs

SYSTEMS NOT CONDUCTING STUDIES	***July 1, 1999 to January 1, 2000***
	January 1, 2000 to July 1, 2000
SYSTEMS CONDUCTING STUDIES	***July 1, 2000 to January 1, 2001***
	January 1, 2001 to July 1, 2001

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER

LEAD AND COPPER TAP WATER SAMPLING

- **NUMBER AND FREQUENCY OF SAMPLING**
  - 1 sample at 20 sites every 6 months

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

- **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
  - PARAMETERS SAMPLED
    - pH
    - Alkalinity
    - Calcium, when calcium carbonate stabilization used
    - Orthophosphate, when phosphate-based inhibitor used
    - Silica, when silicate-based inhibitor used
  - NUMBER AND FREQUENCY OF SAMPLING
    - 2 samples at 2 sites every 6 months

- **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
  - PARAMETERS SAMPLED
    - pH
    - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
    - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
  - NUMBER AND FREQUENCY OF SAMPLING
    - 1 sample at each entry point every 2 weeks

MONITORING PERIODS

- **SYSTEMS NOT CONDUCTING STUDIES**
  - FIRST MONITORING PERIOD
    - July 1, 1999 to January 1, 2000 (submit by January 11, 2000)
  - SECOND MONITORING PERIOD
    - January 1, 2000 to July 1, 2000 (submit by July 11, 2000)

- **SYSTEMS CONDUCTING STUDIES**
  - FIRST MONITORING PERIOD
    - July 1, 2000 to January 1, 2001 (submit by January 11, 2001)
  - SECOND MONITORING PERIOD
    - January 1, 2001 to July 1, 2001 (submit by July 11, 2001)

REDUCED MONITORING REQUIREMENTS FOR SYSTEMS SERVING 501 TO 3,300 PERSONS

SYSTEMS NOT CONDUCTING STUDIES ***Beginning July 1, 2000***
SYSTEMS CONDUCTING STUDIES ***Beginning July 1, 2001***

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER AND MAY REDUCE MONITORING AS FOLLOWS:

LEAD AND COPPER TAP WATER SAMPLING

✦ **System exceeding an action level, but maintaining values for WQPs at representative sites in the distribution system for 2 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 1 year, may reduce lead and copper tap water sampling as follows:**

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 10 sites annually

✦ **REQUESTING REDUCED SAMPLING**
- System must submit written request asking the state to reduce the number and frequency of lead and copper tap water sampling (see form on page A-102)
- State must review lead and copper data submitted by the system and provide a written response

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **System maintaining values for WQPs at representative sites in the distribution system for 2 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 1 year, may reduce WQP sampling as follows:**

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 2 sites every 6 months

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

REDUCED MONITORING PERIODS

✦ **SYSTEMS NOT CONDUCTING STUDIES**

- **Lead and Copper Must Be Sampled Annually**
  - July 1, 2001 (submit by July 11, 2001)
  - July 1, 2002 (submit by July 11, 2002)
  - July 1, 2003 (submit by July 11, 2003)
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Every 6 Months**
  - January 1, 2001 (submit by January 11, 2001)
  - July 1, 2001 (submit by July 11, 2001)
  - January 1, 2002 (submit by January 11, 2002)
  - July 1, 2002 (submit by July 11, 2002)
  - January 1, 2003 (submit by January 11, 2003)
  - July 1, 2003 (submit by July 11, 2003)
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

✦ **SYSTEMS CONDUCTING STUDIES**

- **Lead and Copper Must Be Sampled Annually**
  - July 1, 2002 (submit by July 11, 2002)
  - July 1, 2003 (submit by July 11, 2003)
  - July 1, 2004 (submit by July 11, 2004)
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Every 6 Months**
  - January 1, 2002 (submit by January 11, 2002)
  - July 1, 2002 (submit by July 11, 2002)
  - January 1, 2003 (submit by January 11, 2003)
  - July 1, 2003 (submit by July 11, 2003)
  - January 1, 2004 (submit by January 11, 2004)
  - July 1, 2004 (submit by July 11, 2004)
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

REDUCED MONITORING REQUIREMENTS FOR SYSTEMS SERVING 501 TO 3,300 PERSONS

SYSTEMS NOT CONDUCTING STUDIES ***Beginning July 1, 2003***
SYSTEMS CONDUCTING STUDIES ***Beginning July 1, 2004***

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER AND MAY REDUCE MONITORING AS FOLLOWS:

LEAD AND COPPER TAP WATER SAMPLING

✦ **System exceeding an action level, but maintaining values for WQPs at representative sites in the distribution system for 6 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 3 years, may reduce lead and copper tap water sampling as follows:**

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 10 sites every 3 years

✦ **REQUESTING REDUCED SAMPLING**
- System must submit written request asking the state to reduce the number and frequency of lead and copper tap water sampling (see form on page A-102)
- State must review lead and copper data submitted by the system and provide a written response

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **System maintaining values for WQPs at representative sites in the distribution system for 6 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 3 years, may reduce WQP sampling as follows:**

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 2 sites annually

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

REDUCED MONITORING PERIODS

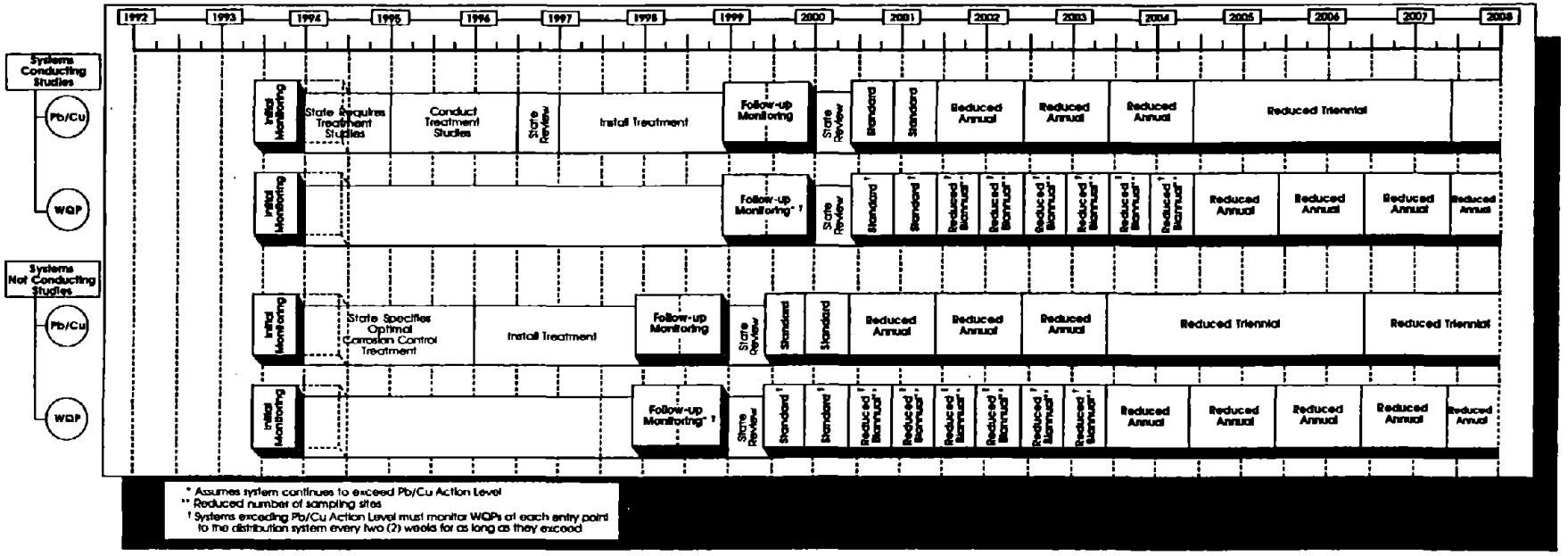
✦ **SYSTEMS NOT CONDUCTING STUDIES**

- **Lead and Copper Must Be Sampled Every 3 Years**
  - July 1, 2006 (submit by July 11, 2006)
  - July 1, 2009 (submit by July 11, 2009)
  - July 1, 2012 (submit by July 11, 2012)
  - Every 3 years thereafter
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Annually**
  - July 1, 2004 (submit by July 11, 2004)
  - July 1, 2005 (submit by July 11, 2005)
  - July 1, 2006 (submit by July 11, 2006)
  - Annually thereafter
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

✦ **SYSTEMS CONDUCTING STUDIES**

- **Lead and Copper Must Be Sampled Every 3 Years**
  - July 1, 2007 (submit by July 11, 2007)
  - July 1, 2010 (submit by July 11, 2010)
  - July 1, 2013 (submit by July 11, 2013)
  - Every 3 years thereafter
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Annually**
  - July 1, 2005 (submit by July 11, 2005)
  - July 1, 2006 (submit by July 11, 2006)
  - July 1, 2007 (submit by July 11, 2007)
  - Annually thereafter
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

Tap Water Monitoring Requirements For Small Water Systems (101 to 500)



INITIAL MONITORING REQUIREMENTS FOR SYSTEMS SERVING 101 TO 500 PERSONS

1993

FIRST MONITORING PERIOD *July 1, 1993 to January 1, 1994*

✦ The schedule discussed in this section assumes the water system exceeds an action level in the first monitoring period. Systems meeting both action levels should see the monitoring schedule on page A-61 of this guidance.

LEAD AND COPPER TAP WATER SAMPLING

✦ **COLLECTION METHODS NEVER CHANGE**
- One liter
- First draw
- 6-hour standing time

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 10 sites every 6 months

✦ **ADDITIONAL SAMPLING**
- System exceeding an action level should consider collecting lead and copper samples during a second 6-month monitoring period to determine lead and copper tap water levels over the course of an entire year
- These samples should be submitted to the state with the treatment recommendation
- System should collect lead and copper samples early enough in the monitoring period to allow time to collect WQP samples

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **WQP SAMPLES COLLECTED AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM AND AT EACH ENTRY POINT**
- pH
- Alkalinity
- Calcium
- Conductivity
- Temperature
- Orthophosphate, when phosphate-based inhibitor used
- Silica, when silicate-based inhibitor used

✦ **NUMBER OF WQP SAMPLES COLLECTED AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- 2 samples at 1 site during each 6-month monitoring period in which the system exceeds an action level

✦ **NUMBER OF WQP SAMPLES COLLECTED AT EACH ENTRY POINT**
- 2 samples at each entry point during each 6-month monitoring period in which the system exceeds an action level

✦ **ADDITIONAL SAMPLING**
- System exceeding an action level should consider collecting WQP samples during a second 6-month monitoring period to determine the effectiveness of corrosion control treatment over the course of an entire year
- These samples should be submitted to the state with the treatment recommendation

MONITORING PERIODS

✦ **FIRST MONITORING PERIOD**
- July 1, 1993 to January 1, 1994 (submit by January 11, 1994)

✦ **SECOND MONITORING PERIOD (Recommended)**
- January 1, 1994 to July 1, 1994 (submit with treatment recommendation)

FOLLOW-UP MONITORING REQUIREMENTS FOR SYSTEMS SERVING 101 TO 500 PERSONS

SYSTEMS NOT CONDUCTING STUDIES	*January 1, 1998 to July 1, 1998*
	July 1, 1998 to January 1, 1999
SYSTEMS CONDUCTING STUDIES	*January 1, 1999 to July 1, 1999*
	July 1, 1999 to January 1, 2000

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER

LEAD AND COPPER TAP WATER SAMPLING

- **NUMBER AND FREQUENCY OF SAMPLING**
  - 1 sample at 10 sites during each of 2 consecutive 6-month monitoring periods

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

- **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
  - PARAMETERS SAMPLED
    - pH
    - Alkalinity
    - Calcium, when calcium carbonate stabilization used
    - Orthophosphate, when phosphate-based inhibitor used
    - Silica, when silicate-based inhibitor used
  - NUMBER AND FREQUENCY OF SAMPLING
    - 2 samples at 1 site during each of 2 consecutive 6-month monitoring periods

- **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
  - PARAMETERS SAMPLED
    - pH
    - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
    - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
  - NUMBER AND FREQUENCY OF SAMPLING
    - 1 sample at each entry point every 2 weeks

MONITORING PERIODS

- **SYSTEMS NOT CONDUCTING STUDIES**
  - FIRST MONITORING PERIOD
    - January 1, 1998 to July 1, 1998 (submit by July 11, 1998)
  - SECOND MONITORING PERIOD
    - July 1, 1998 to January 1, 1999 (submit by January 11, 1999)

- **SYSTEMS CONDUCTING STUDIES**
  - FIRST MONITORING PERIOD
    - January 1, 1999 to July 1, 1999 (submit by July 11, 1999)
  - SECOND MONITORING PERIOD
    - July 1, 1999 to January 1, 2000 (submit by January 11, 2000)

STATE REVIEWS RESULTS OF FOLLOW-UP SAMPLES

SYSTEMS NOT CONDUCTING STUDIES *January 1, 1999 to July 1, 1999*
SYSTEMS CONDUCTING STUDIES *January 1, 2000 to January 1, 2001*

STATE ESTABLISHES WQPs

- **State establishes WQP values or ranges for measurements for representative points in the distribution system:**
  - pH level
  - Alkalinity concentration, when alkalinity adjusted
  - Calcium concentration, when calcium adjusted
  - Orthophosphate concentration, when a phosphate-based inhibitor is used
  - Silica concentration, when a silicate-based inhibitor is used
- **State establishes chemical dosage rates measured at entry points to the distribution system:**
  - Chemical used to adjust pH, when pH adjusted
  - Chemical used to adjust alkalinity, when alkalinity adjusted
  - Chemical used to adjust calcium, when calcium adjusted
  - Dosage rate of inhibitor used, when inhibitor used

STATE REVIEW PERIOD

- **For systems not conducting studies:**
  - By July 1, 1999 states must establish WQP values that must be met at sampling sites in the distribution system, and chemical dosages that must be maintained at each entry point to the distribution system
- **For systems conducting studies:**
  - By January 1, 2001 states must establish WQP values that must be met at sampling sites in the distribution system, and chemical dosages that must be maintained at each entry point to the distribution system
- **State must inform each system of these WQP values in writing**

MONITORING REQUIREMENTS FOR SYSTEMS SERVING 101 TO 500 PERSONS AFTER STATE ESTABLISHES WQPs

SYSTEMS NOT CONDUCTING STUDIES	*July 1, 1999 to January 1, 2000*
	January 1, 2000 to July 1, 2000
SYSTEMS CONDUCTING STUDIES	*July 1, 2000 to January 1, 2001*
	January 1, 2001 to July 1, 2001

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER

LEAD AND COPPER TAP WATER SAMPLING

- **NUMBER AND FREQUENCY OF SAMPLING**
  - 1 sample at 10 sites every 6 months

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

- **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
  - PARAMETERS SAMPLED
    - pH
    - Alkalinity
    - Calcium, when calcium carbonate stabilization used
    - Orthophosphate, when phosphate-based inhibitor used
    - Silica, when silicate-based inhibitor used
  - NUMBER AND FREQUENCY OF SAMPLING
    - 2 samples at 1 site every 6 months

- **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
  - PARAMETERS SAMPLED
    - pH
    - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
    - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
  - NUMBER AND FREQUENCY OF SAMPLING
    - 1 sample at each entry point every 2 weeks

MONITORING PERIODS

- **SYSTEMS NOT CONDUCTING STUDIES**
  - FIRST MONITORING PERIOD
    - July 1, 1999 to January 1, 2000 (submit by January 11, 2000)
  - SECOND MONITORING PERIOD
    - January 1, 2000 to July 1, 2000 (submit by July 11, 2000)

- **SYSTEMS CONDUCTING STUDIES**
  - FIRST MONITORING PERIOD
    - July 1, 2000 to January 1, 2001 (submit by January 11, 2001)
  - SECOND MONITORING PERIOD
    - January 1, 2001 to July 1, 2001 (submit by July 11, 2001)

REDUCED MONITORING REQUIREMENTS FOR SYSTEMS SERVING 101 TO 500 PERSONS

SYSTEMS NOT CONDUCTING STUDIES ***Beginning July 1, 2000***
SYSTEMS CONDUCTING STUDIES ***Beginning July 1, 2001***

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER AND MAY REDUCE MONITORING AS FOLLOWS:

LEAD AND COPPER TAP WATER SAMPLING

✦ **System exceeding an action level, but maintaining values for WQPs at representative sites in the distribution system for 2 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 1 year, may reduce lead and copper tap water sampling as follows:**

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 5 sites annually

✦ **REQUESTING REDUCED SAMPLING**
- System must submit written request asking the state to reduce the number and frequency of lead and copper tap water sampling (see form on page A-102)
- State must review lead and copper data submitted by the system and provide a written response

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **System maintaining values for WQPs at representative sites in the distribution system for 2 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 1 year, may reduce WQP sampling as follows:**

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 1 site every 6 months

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

REDUCED MONITORING PERIODS

✦ SYSTEMS NOT CONDUCTING STUDIES

- **Lead and Copper Must Be Sampled Annually**
  - July 1, 2001 (submit by July 11, 2001)
  - July 1, 2002 (submit by July 11, 2002)
  - July 1, 2003 (submit by July 11, 2003)
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Every 6 Months**
  - January 1, 2001 (submit by January 11, 2001)
  - July 1, 2001 (submit by July 11, 2001)
  - January 1, 2002 (submit by January 11, 2002)
  - July 1, 2002 (submit by July 11, 2002)
  - January 1, 2003 (submit by January 11, 2003)
  - July 1, 2003 (submit by July 11, 2003)
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

✦ SYSTEMS CONDUCTING STUDIES

- **Lead and Copper Must Be Sampled Annually**
  - July 1, 2002 (submit by July 11, 2002)
  - July 1, 2003 (submit by July 11, 2003)
  - July 1, 2004 (submit by July 11, 2004)
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Every 6 Months**
  - January 1, 2002 (submit by January 11, 2002)
  - July 1, 2002 (submit by July 11, 2002)
  - January 1, 2003 (submit by January 11, 2003)
  - July 1, 2003 (submit by July 11, 2003)
  - January 1, 2004 (submit by January 11, 2004)
  - July 1, 2004 (submit by July 11, 2004)
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

REDUCED MONITORING REQUIREMENTS FOR SYSTEMS SERVING 101 TO 500 PERSONS

SYSTEMS NOT CONDUCTING STUDIES ***Beginning July 1, 2003***
SYSTEMS CONDUCTING STUDIES ***Beginning July 1, 2004***

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER AND MAY REDUCE MONITORING AS FOLLOWS:

LEAD AND COPPER TAP WATER SAMPLING

✦ **System exceeding an action level, but maintaining values for WQPs at representative sites in the distribution system for 6 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 3 years, may reduce lead and copper tap water sampling as follows:**

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 5 sites every 3 years

✦ **REQUESTING REDUCED SAMPLING**
- System must submit written request asking the state to reduce the number and frequency of lead and copper tap water sampling (see form on page A-102)
- State must review lead and copper data submitted by the system and provide a written response

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **System maintaining values for WQPs at representative sites in the distribution system for 6 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 3 years, may reduce WQP sampling as follows:**

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 1 site annually

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

REDUCED MONITORING PERIODS

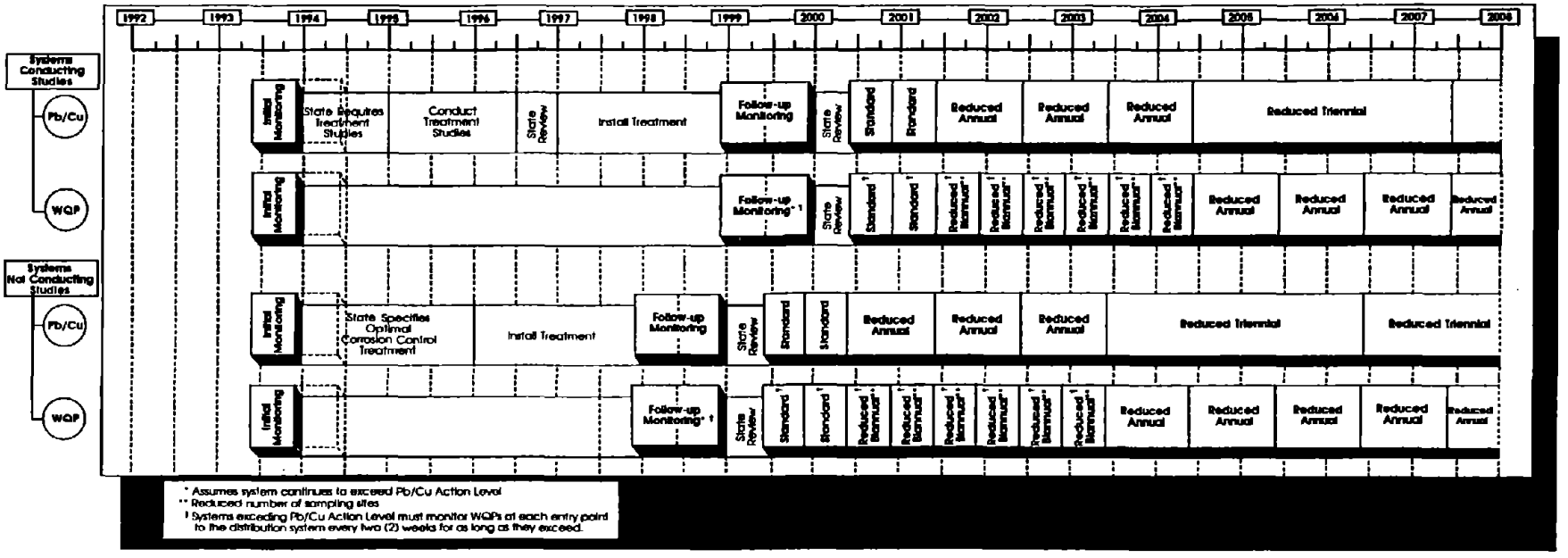
✦ SYSTEMS NOT CONDUCTING STUDIES

- **Lead and Copper Must Be Sampled Every 3 Years**
  - July 1, 2006 (submit by July 11, 2006)
  - July 1, 2009 (submit by July 11, 2009)
  - July 1, 2012 (submit by July 11, 2012)
  - Every 3 years thereafter
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Annually**
  - July 1, 2004 (submit by July 11, 2004)
  - July 1, 2005 (submit by July 11, 2005)
  - July 1, 2006 (submit by July 11, 2006)
  - Annually thereafter
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

✦ SYSTEMS CONDUCTING STUDIES

- **Lead and Copper Must Be Sampled Every 3 Years**
  - July 1, 2007 (submit by July 11, 2007)
  - July 1, 2010 (submit by July 11, 2010)
  - July 1, 2013 (submit by July 11, 2013)
  - Every 3 years thereafter
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Annually**
  - July 1, 2005 (submit by July 11, 2005)
  - July 1, 2006 (submit by July 11, 2006)
  - July 1, 2007 (submit by July 11, 2007)
  - Annually thereafter
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

Tap Water Monitoring Requirements For Small Water Systems (≤100)



INITIAL MONITORING REQUIREMENTS FOR SYSTEMS SERVING ≤100 PERSONS

1993

FIRST MONITORING PERIOD *July 1, 1993 to January 1, 1994*

✦ The schedule discussed in this section assumes the water system exceeds an action level in the first monitoring period. Systems meeting both action levels should see the monitoring schedule on page A-75 of this guidance.

LEAD AND COPPER TAP WATER SAMPLING

✦ **COLLECTION METHODS NEVER CHANGE**
- One liter
- First draw
- 6-hour standing time

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 5 sites every 6 months

✦ **ADDITIONAL SAMPLING**
- System exceeding an action level should consider collecting lead and copper samples during a second 6-month monitoring period to determine lead and copper tap water levels over the course of an entire year
- These samples should be submitted to the state with the treatment recommendation
- System should collect lead and copper samples early enough in the monitoring period to allow time to collect WQP samples

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **WQP SAMPLES COLLECTED AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM AND AT EACH ENTRY POINT**
- pH
- Alkalinity
- Calcium
- Conductivity
- Temperature
- Orthophosphate, when phosphate-based inhibitor used
- Silica, when silicate-based inhibitor used

✦ **NUMBER OF WQP SAMPLES COLLECTED AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- 2 samples at 1 site during each 6-month monitoring period in which the system exceeds an action level

✦ **NUMBER OF WQP SAMPLES COLLECTED AT EACH ENTRY POINT**
- 2 samples at each entry point during each 6-month monitoring period in which the system exceeds an action level

✦ **ADDITIONAL SAMPLING**
- System exceeding an action level should consider collecting WQP samples during a second 6-month monitoring period to determine the effectiveness of corrosion control treatment over the course of an entire year
- These samples should be submitted to the state with the treatment recommendation

MONITORING PERIODS

✦ **FIRST MONITORING PERIOD**
- July 1, 1993 to January 1, 1994 (submit by January 11, 1994)

✦ **SECOND MONITORING PERIOD (Recommended)**
- January 1, 1994 to July 1, 1994 (submit with treatment recommendation)

FOLLOW-UP MONITORING REQUIREMENTS FOR SYSTEMS SERVING ≤100 PERSONS

SYSTEMS NOT CONDUCTING STUDIES	*January 1, 1998 to July 1, 1998*
	July 1, 1998 to January 1, 1999
SYSTEMS CONDUCTING STUDIES	*January 1, 1999 to July 1, 1999*
	July 1, 1999 to January 1, 2000

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER

LEAD AND COPPER TAP WATER SAMPLING

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 5 sites during each of 2 consecutive 6-month monitoring periods

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 1 site during each of 2 consecutive 6-month monitoring periods

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

MONITORING PERIODS

✦ **SYSTEMS NOT CONDUCTING STUDIES**
- FIRST MONITORING PERIOD
  - January 1, 1998 to July 1, 1998 (submit by July 11, 1998)
- SECOND MONITORING PERIOD
  - July 1, 1998 to January 1, 1999 (submit by January 11, 1999)

✦ **SYSTEMS CONDUCTING STUDIES**
- FIRST MONITORING PERIOD
  - January 1, 1999 to July 1, 1999 (submit by July 11, 1999)
- SECOND MONITORING PERIOD
  - July 1, 1999 to January 1, 2000 (submit by January 11, 2000)

STATE REVIEWS RESULTS OF FOLLOW-UP SAMPLES

SYSTEMS NOT CONDUCTING STUDIES *January 1, 1999 to July 1, 1999*
SYSTEMS CONDUCTING STUDIES *January 1, 2000 to January 1, 2001*

STATE ESTABLISHES WQPs

- **State establishes WQP values or ranges for measurements for representative points in the distribution system:**
  - pH level
  - Alkalinity concentration, when alkalinity adjusted
  - Calcium concentration, when calcium adjusted
  - Orthophosphate concentration, when a phosphate-based inhibitor is used
  - Silica concentration, when a silicate-based inhibitor is used
- **State establishes chemical dosage rates measured at entry points to the distribution system:**
  - Chemical used to adjust pH, when pH adjusted
  - Chemical used to adjust alkalinity, when alkalinity adjusted
  - Chemical used to adjust calcium, when calcium adjusted
  - Dosage rate of inhibitor used, when inhibitor used

STATE REVIEW PERIOD

- **For systems not conducting studies:**
  - By July 1, 1999 states must establish WQP values that must be met at sampling sites in the distribution system, and chemical dosages that must be maintained at each entry point to the distribution system.
- **For systems conducting studies:**
  - By January 1, 2001 states must establish WQP values that must be met at sampling sites in the distribution system, and chemical dosages that must be maintained at each entry point to the distribution system
- **State must inform each system of these WQP values in writing**

MONITORING REQUIREMENTS FOR SYSTEMS SERVING ≤100 PERSONS AFTER STATE ESTABLISHES WQPs

SYSTEMS NOT CONDUCTING STUDIES	*July 1, 1999 to January 1, 2000*
	January 1, 2000 to July 1, 2000
SYSTEMS CONDUCTING STUDIES	*July 1, 2000 to January 1, 2001*
	January 1, 2001 to July 1, 2001

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER

LEAD AND COPPER TAP WATER SAMPLING

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 5 sites every 6 months

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 1 site every 6 months

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

MONITORING PERIODS

- **SYSTEMS NOT CONDUCTING STUDIES**
  - FIRST MONITORING PERIOD
    - July 1, 1999 to January 1, 2000 (submit by January 11, 2000)
  - SECOND MONITORING PERIOD
    - January 1, 2000 to July 1, 2000 (submit by July 11, 2000)

- **SYSTEMS CONDUCTING STUDIES**
  - FIRST MONITORING PERIOD
    - July 1, 2000 to January 1, 2001 (submit by January 11, 2001)
  - SECOND MONITORING PERIOD
    - January 1, 2001 to July 1, 2001 (submit by July 11, 2001)

REDUCED MONITORING REQUIREMENTS FOR SYSTEMS SERVING ≤100 PERSONS

SYSTEMS NOT CONDUCTING STUDIES ***Beginning July 1, 2000***
SYSTEMS CONDUCTING STUDIES ***Beginning July 1, 2001***

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER AND MAY REDUCE MONITORING AS FOLLOWS:

LEAD AND COPPER TAP WATER SAMPLING

✦ **System exceeding an action level, but maintaining values for WQPs at representative sites in the distribution system for 2 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 1 year, may reduce lead and copper tap water sampling as follows:**

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 5 sites annually

✦ **REQUESTING REDUCED SAMPLING**
- System must submit written request asking the state to reduce the number and frequency of lead and copper tap water sampling (see form on page A-102)
- State must review lead and copper data submitted by the system and provide a written response

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **System maintaining values for WQPs at representative sites in the distribution system for 2 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 1 year, may reduce WQP sampling as follows:**

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 1 site every 6 months

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

REDUCED MONITORING PERIODS

✦ **SYSTEMS NOT CONDUCTING STUDIES**

- **Lead and Copper Must Be Sampled Annually**
  - July 1, 2001 (submit by July 11, 2001)
  - July 1, 2002 (submit by July 11, 2002)
  - July 1, 2003 (submit by July 11, 2003)
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Every 6 Months**
  - January 1, 2001 (submit by January 11, 2001)
  - July 1, 2001 (submit by July 11, 2001)
  - January 1, 2002 (submit by January 11, 2002)
  - July 1, 2002 (submit by July 11, 2002)
  - January 1, 2003 (submit by January 11, 2003)
  - July 1, 2003 (submit by July 11, 2003)
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

✦ **SYSTEMS CONDUCTING STUDIES**

- **Lead and Copper Must Be Sampled Annually**
  - July 1, 2002 (submit by July 11, 2002)
  - July 1, 2003 (submit by July 11, 2003)
  - July 1, 2004 (submit by July 11, 2004)
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Every 6 Months**
  - January 1, 2002 (submit by January 11, 2002)
  - July 1, 2002 (submit by July 11, 2002)
  - January 1, 2003 (submit by January 11, 2003)
  - July 1, 2003 (submit by July 11, 2003)
  - January 1, 2004 (submit by January 11, 2004)
  - July 1, 2004 (submit by July 11, 2004)
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

REDUCED MONITORING REQUIREMENTS FOR SYSTEMS SERVING ≤100 PERSONS

SYSTEMS NOT CONDUCTING STUDIES ***Beginning July 1, 2003***
SYSTEMS CONDUCTING STUDIES ***Beginning July 1, 2004***

A SYSTEM THAT MEETS BOTH ACTION LEVELS MUST CONTINUE TO MONITOR ONLY LEAD AND COPPER AND MAY REDUCE MONITORING AS FOLLOWS:

LEAD AND COPPER TAP WATER SAMPLING

✦ **System exceeding an action level, but maintaining values for WQPs at representative sites in the distribution system for 6 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 3 years, may reduce lead and copper tap water sampling as follows:**

✦ **NUMBER AND FREQUENCY OF SAMPLING**
- 1 sample at 5 sites every 3 years

✦ **REQUESTING REDUCED SAMPLING**
- System must submit written request asking the state to reduce the number and frequency of lead and copper tap water sampling (see form on page A-102)
- State must review lead and copper data submitted by the system and provide a written response

A SYSTEM CONTINUING TO EXCEED AN ACTION LEVEL MUST MONITOR WATER QUALITY PARAMETERS

WATER QUALITY PARAMETER (WQP) SAMPLING

✦ **System maintaining values for WQPs at representative sites in the distribution system for 6 consecutive 6-month monitoring periods, and at each entry point to the distribution system for 3 years, may reduce WQP sampling as follows:**

✦ **AT REPRESENTATIVE SITES IN THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - Alkalinity
  - Calcium, when calcium carbonate stabilization used
  - Orthophosphate, when phosphate-based inhibitor used
  - Silica, when silicate-based inhibitor used
- NUMBER AND FREQUENCY OF SAMPLING
  - 2 samples at 1 site annually

✦ **AT EACH ENTRY POINT TO THE DISTRIBUTION SYSTEM**
- PARAMETERS SAMPLED
  - pH
  - When alkalinity is adjusted, the dosage rate of the chemical used to adjust it and the concentration of alkalinity
  - When an inhibitor is used, the dosage rate of the inhibitor and the concentration of orthophosphate or silicate (whichever is used)
- NUMBER AND FREQUENCY OF SAMPLING
  - 1 sample at each entry point every 2 weeks

REDUCED MONITORING PERIODS

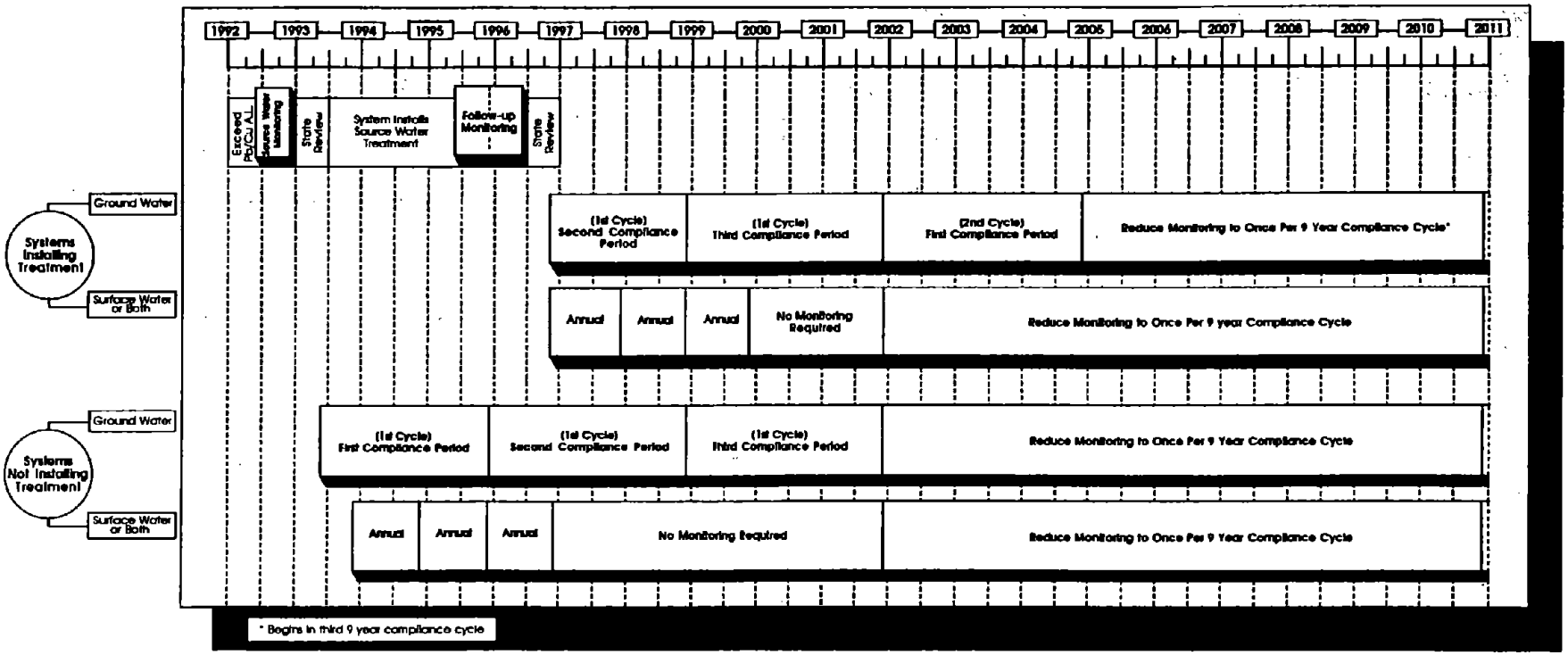
✦ **SYSTEMS NOT CONDUCTING STUDIES**

- **Lead and Copper Must Be Sampled Every 3 Years**
  - July 1, 2006 (submit by July 11, 2006)
  - July 1, 2009 (submit by July 11, 2009)
  - July 1, 2012 (submit by July 11, 2012)
  - Every 3 years thereafter
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Annually**
  - July 1, 2004 (submit by July 11, 2004)
  - July 1, 2005 (submit by July 11, 2005)
  - July 1, 2006 (submit by July 11, 2006)
  - Annually thereafter
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

✦ **SYSTEMS CONDUCTING STUDIES**

- **Lead and Copper Must Be Sampled Every 3 Years**
  - July 1, 2007 (submit by July 11, 2007)
  - July 1, 2010 (submit by July 11, 2010)
  - July 1, 2013 (submit by July 11, 2013)
  - Every 3 years thereafter
- **WQPs Must Be Sampled at Representative Sites in the Distribution System Annually**
  - July 1, 2005 (submit by July 11, 2005)
  - July 1, 2006 (submit by July 11, 2006)
  - July 1, 2007 (submit by July 11, 2007)
  - Annually thereafter
- **WQPs Must Be Sampled at Each Entry Point to the Distribution System Every 2 Weeks**

Source Water Monitoring For Lead and Copper For Large Systems (>50,000)



INITIAL SOURCE WATER MONITORING REQUIREMENTS FOR LARGE SYSTEMS

1992

FIRST MONITORING PERIOD *July 1, 1992 to January 1, 1993*

✦ **The schedule discussed in this section assumes the water system exceeds an action level in the first monitoring period.**

LEAD AND COPPER SOURCE WATER SAMPLING

✦ **If the lead or copper action level is exceeded in tap water samples the system must collect 1 sample at each entry point to the distribution system in accordance with the collection methods specified in §141.23(a)(1) to (4)**

MONITORING PERIODS

✦ **FIRST SOURCE WATER MONITORING PERIOD**

- July 1, 1992 to January 1, 1993 (submit by January 11, 1993)
- System must submit source water treatment recommendation with lead and copper source water samples

SOURCE WATER MONITORING REQUIREMENT AFTER THE STATE SETS MAXIMUM PERMISSIBLE LEAD AND COPPER LEVELS FOR SYSTEMS NOT INSTALLING SOURCE WATER TREATMENT

1993

PERIOD FOR STATE DETERMINATION *January 1, 1993 to July 1, 1993*

- **If a system is not required to install source water treatment the state will establish maximum permissible lead and copper levels with which the system must continue to comply.**
- **The system must continue to deliver finished water to each entry point to the distribution system with lead and copper concentrations below those levels set by the state.**

LEAD AND COPPER SOURCE WATER MONITORING

- **GROUNDWATER SYSTEMS**
  - System must collect 1 sample at each entry point to the distribution system during the 3-year compliance period in effect when the state determines treatment is not needed, and it sets maximum permissible lead and copper levels
  - System must collect 1 sample at each entry point to the distribution system during each subsequent 3-year compliance period
- **SURFACE WATER SYSTEMS**
  - System must collect 1 sample at each entry point to the distribution system annually
  - The first year begins on the date the state determines treatment is not needed and it sets maximum permissible lead and copper levels

MONITORING PERIODS

- **GROUNDWATER SYSTEMS**
  - System must collect all source water samples and submit the results to the state by the following dates:

1st Compliance Period	January 1, 1996	January 11, 1996
2nd Compliance Period	January 1, 1999	January 11, 1999
3rd Compliance Period	January 1, 2002	January 11, 2002

- **SURFACE WATER SYSTEMS**
  - System must collect all source water samples and submit the results to the state by the following dates:

1st Year	January 1, 1994	January 11, 1994
2nd Year	January 1, 1995	January 11, 1995
3rd Year	January 1, 1996	January 11, 1996

FOLLOW-UP SOURCE WATER MONITORING FOR LARGE SYSTEMS INSTALLING SOURCE WATER TREATMENT

1996

FIRST MONITORING PERIOD — *July 1, 1995 to January 1, 1996*

SECOND MONITORING PERIOD — *January 1, 1996 to July 1, 1996*

✦ **If a system is not required to install source water treatment, it has 24 months to install and operate the treatment and 12 months to collect and submit follow-up source water samples.**

LEAD AND COPPER SOURCE WATER MONITORING

✦ NUMBER AND FREQUENCY
- System must collect 1 sample at each entry point to the distribution system during each of 2 consecutive 6-month monitoring periods

MONITORING PERIODS

✦ FIRST MONITORING PERIOD
- July 1, 1995 to January 1, 1996 (submit by January 11, 1996)

✦ SECOND MONITORING PERIOD
- January 1, 1996 to July 1, 1996 (submit by July 11, 1996)

SOURCE WATER MONITORING REQUIREMENT AFTER THE STATE SETS MAXIMUM PERMISSIBLE LEAD AND COPPER LEVELS FOR SYSTEMS INSTALLING SOURCE WATER TREATMENT

1997

PERIOD FOR STATE DETERMINATION *July 1, 1996 to January 1, 1997*

- **After a system installs source water treatment, collects follow-up samples, and submits the results to the state, the state will set maximum permissible lead and copper levels.**
- **System must continue delivering finished water to each entry point to the distribution system with lead and copper concentrations below the levels set by the state to remain in compliance.**

LEAD AND COPPER SOURCE WATER MONITORING

- **GROUNDWATER SYSTEMS**
  - System must collect 1 sample at each entry point to the distribution system during the 3-year compliance period in effect when the state sets maximum permissible lead and copper levels
  - System must collect 1 sample at each entry point to the distribution system during each subsequent 3-year compliance period
- **SURFACE WATER SYSTEMS**
  - System must collect 1 sample at each entry point to the distribution system annually
  - The first year begins on the date the state sets maximum permissible lead and copper levels

MONITORING PERIODS

- **GROUNDWATER SYSTEMS**
  - System must collect source water samples and submit the results to the state by the following dates:

1st Compliance Period	January 1, 1999	January 11, 1999
2nd Compliance Period	January 1, 2002	January 11, 2002
3rd Compliance Period	January 1, 2005	January 11, 2005

- **SURFACE WATER SYSTEMS**
  - System must collect source water samples and submit the results to the state by the following dates:

1st Year	January 1, 1998	January 11, 1998
2nd Year	January 1, 1999	January 11, 1999
3rd Year	January 1, 2000	January 11, 2000

REDUCED MONITORING REQUIREMENTS FOR LARGE SYSTEMS NOT INSTALLING TREATMENT

2002

GROUNDWATER SYSTEMS — *Beginning January 1, 2002*

SURFACE WATER SYSTEMS — *Beginning January 1, 2002*

LEAD AND COPPER SOURCE WATER MONITORING

✦ **GROUNDWATER SYSTEMS**

- System that manitains lead and copper concentrations below the levels set by the state for 3 consecutive 3-year compliance periods may reduce source water monitoring to once per 9-year compliance cycle

✦ **SURFACE WATER SYSTEMS**

- System that maintains lead and copper concentrations below the levels set by the state for 3 consecutive years may reduce source water monitoring to once per 9-year compliance cycle

REDUCED MONITORING PERIODS

✦ **GROUNDWATER AND SURFACE WATER SYSTEMS**

- Reduced monitoring would take place in the second 9-year compliance cycle, which begins January 1, 2002 and ends January 1, 2011
- System must collect 1 sample at each entry point to the distribution system and submit the results to the state by January 11, 2011

REDUCED MONITORING REQUIREMENTS FOR LARGE SYSTEMS INSTALLING TREATMENT

GROUNDWATER SYSTEMS ***Beginning January 1, 2011***

SURFACE WATER SYSTEMS ***Beginning January 1, 2002***

LEAD AND COPPER SOURCE WATER MONITORING

✦ **GROUNDWATER SYSTEMS**

- System that manitains lead and copper concentrations below the levels set by the state for 3 consecutive 3-year compliance periods may reduce source water monitoring to once per 9-year compliance cycle

✦ **SURFACE WATER SYSTEMS**

- System that maintains lead and copper concentrations below the levels set by the state for 3 consecutive years may reduce source water monitoring to once per 9-year compliance cycle

REDUCED MONITORING PERIODS

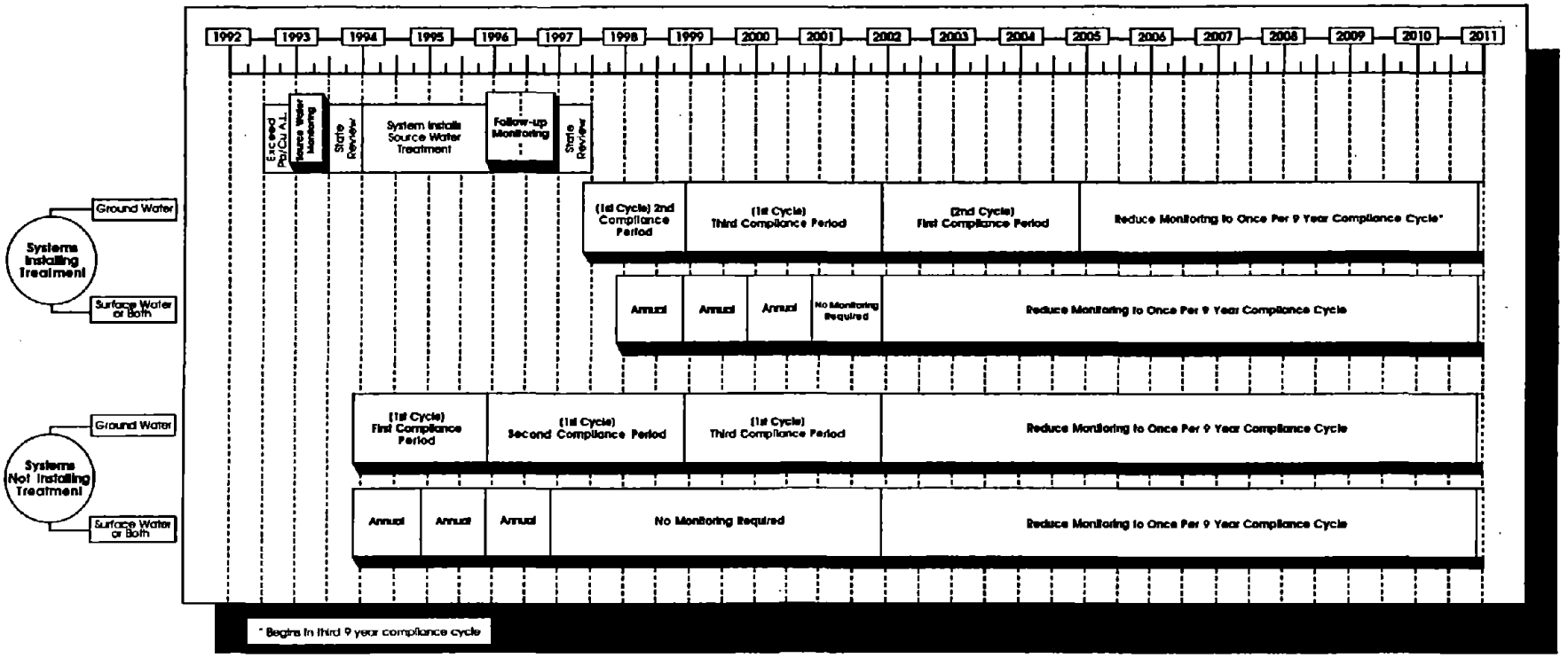
✦ **GROUNDWATER SYSTEMS**

- Reduced monitoring would take place in the third 9-year compliance cycle, which begins January 1, 2011 and ends January 1, 2020
- System must collect 1 sample at each entry point to the distribution system and submit the results to the state by January 11, 2020

✦ **SURFACE WATER SYSTEMS**

- Reduced monitoring would take place in the second 9-year compliance cycle, which begins January 1, 2002 and ends January 1, 2011
- System must collect 1 sample at each entry point to the distribution system and submit the results to the state by January 11, 2011

Source Water Monitoring For Lead and Copper For Medium Systems (3,300 to 50,000)



INITIAL SOURCE WATER MONITORING REQUIREMENTS FOR MEDIUM-SIZE SYSTEMS

1993

FIRST MONITORING PERIOD *January 1, 1993 to July 1, 1993*

- **The schedule discussed in this section assumes the water system exceeds an action level in the first monitoring period.**

LEAD AND COPPER SOURCE WATER SAMPLING

- **If the lead or copper action level is exceeded in tap water samples the system must collect 1 sample at each entry point to the distribution system in accordance with the collection methods specified in §141.23(a)(1) to (4)**

MONITORING PERIODS

- **FIRST SOURCE WATER MONITORING PERIOD**
  - January 1, 1993 to July 1, 1993 (submit by July 11, 1993)
  - System must submit source water treatment recommendation with lead and copper source water samples

SOURCE WATER MONITORING REQUIREMENT AFTER THE STATE SETS MAXIMUM PERMISSIBLE LEAD AND COPPER LEVELS FOR SYSTEMS NOT INSTALLING SOURCE WATER TREATMENT

1994

PERIOD FOR STATE DETERMINATION *July 1, 1993 to January 1, 1994*

- **If a system is not required to install source water treatment the state will establish maximum permissible lead and copper levels with which the system must continue to comply.**
- **The system must continue to deliver finished water to each entry point to the distribution system with lead and copper concentrations below those levels set by the state.**

LEAD AND COPPER SOURCE WATER MONITORING

- **GROUNDWATER SYSTEMS**
  - System must collect 1 sample at each entry point to the distribution system during the 3-year compliance period in effect when the state determines treatment is not needed, and it sets maximum permissible lead and copper levels
  - System must collect 1 sample at each entry point to the distribution system during each subsequent 3-year compliance period
- **SURFACE WATER SYSTEMS**
  - System must collect 1 sample at each entry point to the distribution system annually
  - The first year begins on the date the state determines treatment is not needed and it sets maximum permissible lead and copper levels

MONITORING PERIODS

- **GROUNDWATER SYSTEMS**
  - System must collect all source water samples and submit the results to the state by the following dates:

1st Compliance Period	January 1, 1996	January 11, 1996
2nd Compliance Period	January 1, 1999	January 11, 1999
3rd Compliance Period	January 1, 2002	January 11, 2002

- **SURFACE WATER SYSTEMS**
  - System must collect all source water samples and submit the results to the state by the following dates:

1st Year	January 1, 1995	January 11, 1995
2nd Year	January 1, 1996	January 11, 1996
3rd Year	January 1, 1997	January 11, 1997

FOLLOW-UP SOURCE WATER MONITORING FOR MEDIUM-SIZE SYSTEMS INSTALLING SOURCE WATER TREATMENT

FIRST MONITORING PERIOD	*January 1, 1996 to July 1, 1996*
SECOND MONITORING PERIOD	*July 1, 1996 to January 1, 1997*

✦ **If a system is not required to install source water treatment, it has 24 months to install and operate the treatment and 12 months to collect and submit follow-up source water samples.**

LEAD AND COPPER SOURCE WATER MONITORING

✦ **NUMBER AND FREQUENCY**
- System must collect 1 sample at each entry point to the distribution system during each of 2 consecutive 6-month monitoring periods

MONITORING PERIODS

✦ **FIRST MONITORING PERIOD**
- January 1, 1996 to July 1, 1996 (submit by July 11, 1996)

✦ **SECOND MONITORING PERIOD**
- July 1, 1996 to January 1, 1997 (submit by January 11, 1997)

SOURCE WATER MONITORING REQUIREMENT AFTER THE STATE SETS MAXIMUM PERMISSIBLE LEAD AND COPPER LEVELS FOR SYSTEMS INSTALLING SOURCE WATER TREATMENT

1997

PERIOD FOR STATE DETERMINATION *January 1, 1997 to July 1, 1997*

- **After a system installs source water treatment, collects follow-up samples, and submits the results to the state, the state will set maximum permissible lead and copper levels.**
- **System must continue delivering finished water to each entry point to the distribution system with lead and copper concentrations below the levels set by the state to remain in compliance.**

LEAD AND COPPER SOURCE WATER MONITORING

- **GROUNDWATER SYSTEMS**
  - System must collect 1 sample at each entry point to the distribution system during the 3-year compliance period in effect when the state sets maximum permissible lead and copper levels
  - System must collect 1 sample at each entry point to the distribution system during each subsequent 3-year compliance period
- **SURFACE WATER SYSTEMS**
  - System must collect 1 sample at each entry point to the distribution system annually
  - The first year begins on the date the state sets maximum permissible lead and copper levels

MONITORING PERIODS

- **GROUNDWATER SYSTEMS**
  - System must collect source water samples and submit the results to the state by the following dates:

1st Compliance Period	January 1, 1999	January 11, 1999
2nd Compliance Period	January 1, 2002	January 11, 2002
3rd Compliance Period	January 1, 2005	January 11, 2005

- **SURFACE WATER SYSTEMS**
  - System must collect source water samples and submit the results to the state by the following dates:

1st Year	January 1, 1998	January 11, 1998
2nd Year	January 1, 1999	January 11, 1999
3rd Year	January 1, 2000	January 11, 2000

REDUCED MONITORING REQUIREMENTS FOR MEDIUM-SIZE SYSTEMS NOT INSTALLING TREATMENT

2002

GROUNDWATER SYSTEMS — *Beginning January 1, 2002*

SURFACE WATER SYSTEMS — *Beginning January 1, 2002*

LEAD AND COPPER SOURCE WATER MONITORING

✦ **GROUNDWATER SYSTEMS**

- System that manitains lead and copper concentrations below the levels set by the state for 3 consecutive 3-year compliance periods may reduce source water monitoring to once per 9-year compliance cycle

✦ **SURFACE WATER SYSTEMS**

- System that maintains lead and copper concentrations below the levels set by the state for 3 consecutive years may reduce source water monitoring to once per 9-year compliance cycle

REDUCED MONITORING PERIODS

✦ **GROUNDWATER AND SURFACE WATER SYSTEMS**

- Reduced monitoring would take place in the second 9-year compliance cycle, which begins January 1, 2002 and ends January 1, 2011
- System must collect 1 sample at each entry point to the distribution system and submit the results to the state by January 11, 2011

REDUCED MONITORING REQUIREMENTS FOR MEDIUM-SIZE SYSTEMS INSTALLING TREATMENT

2002/2011

GROUNDWATER SYSTEMS — *Beginning January 1, 2011*

SURFACE WATER SYSTEMS — *Beginning January 1, 2002*

LEAD AND COPPER SOURCE WATER MONITORING

✦ **GROUNDWATER SYSTEMS**

- System that manitains lead and copper concentrations below the levels set by the state for 3 consecutive 3-year compliance periods may reduce source water monitoring to once per 9-year compliance cycle

✦ **SURFACE WATER SYSTEMS**

- System that maintains lead and copper concentrations below the levels set by the state for 3 consecutive years may reduce source water monitoring to once per 9-year compliance cycle

REDUCED MONITORING PERIODS

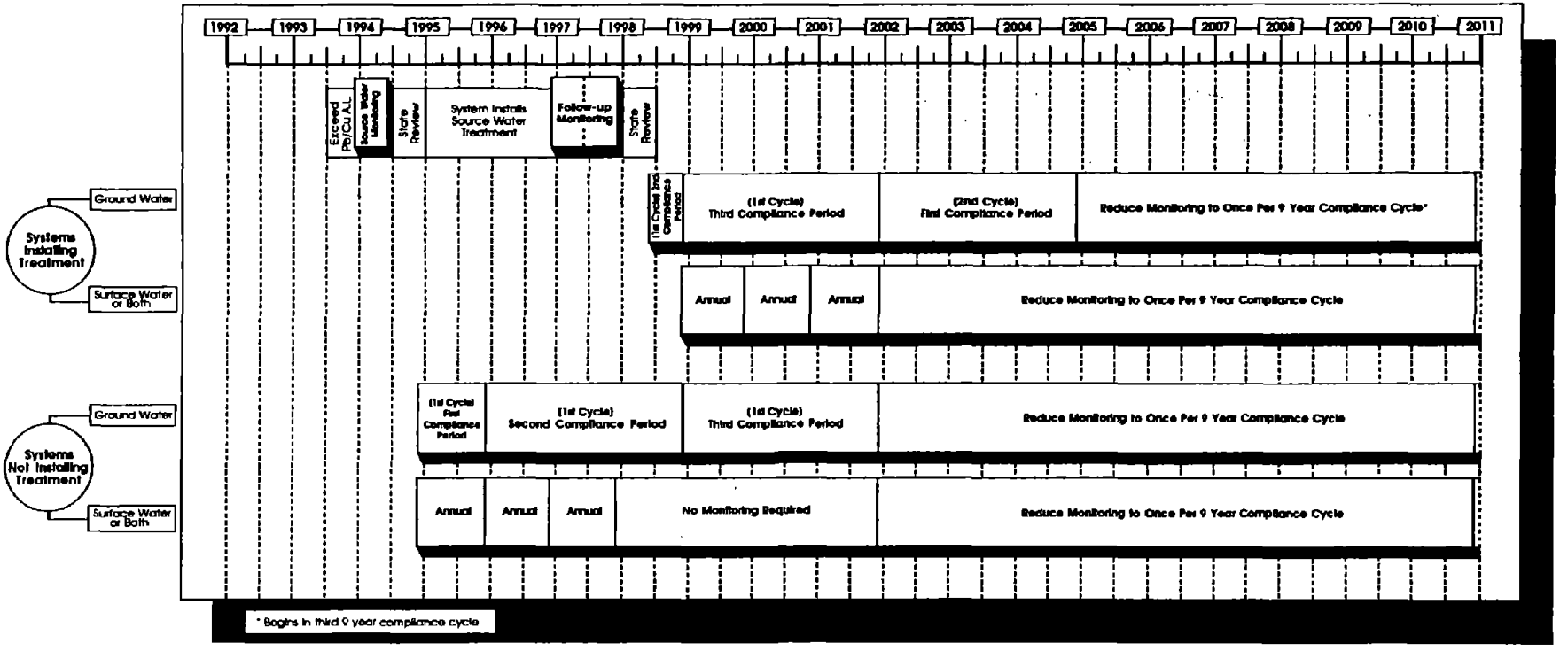
✦ **GROUNDWATER SYSTEMS**

- Reduced monitoring would take place in the third 9-year compliance cycle, which begins January 1, 2011 and ends January 1, 2020 .
- System must collect 1 sample at each entry point to the distribution system and submit the results to the state by January 11, 2020

✦ **SURFACE WATER SYSTEMS**

- Reduced monitoring would take place in the second 9-year compliance cycle, which begins January 1, 2002 and ends January 1, 2011
- System must collect 1 sample at each entry point to the distribution system and submit the results to the state by January 11, 2011

Source Water Monitoring For Lead and Copper For Small Systems (<3,300)



INITIAL SOURCE WATER MONITORING REQUIREMENTS FOR SMALL SYSTEMS

1994

FIRST MONITORING PERIOD *January 1, 1994 to July 1, 1994*

- **The schedule discussed in this section assumes the water system exceeds an action level in the first monitoring period.**

LEAD AND COPPER SOURCE WATER SAMPLING

- **If the lead or copper action level is exceeded in tap water samples the system must collect 1 sample at each entry point to the distribution system in accordance with the collection methods specified in §141.23(a)(1) to (4)**

MONITORING PERIODS

- **FIRST SOURCE WATER MONITORING PERIOD**
  - January 1, 1994 to July 1, 1994 (submit by July 11, 1994)
  - System must submit source water treatment recommendation with lead and copper source water samples

SOURCE WATER MONITORING REQUIREMENT AFTER THE STATE SETS MAXIMUM PERMISSIBLE LEAD AND COPPER LEVELS FOR SYSTEMS NOT INSTALLING SOURCE WATER TREATMENT

1994

PERIOD FOR STATE DETERMINATION *July 1, 1994 to January 1, 1995*

- **If a system is not required to install source water treatment the state will establish maximum permissible lead and copper levels with which the system must continue to comply.**
- **The system must continue to deliver finished water to each entry point to the distribution system with lead and copper concentrations below those levels set by the state.**

LEAD AND COPPER SOURCE WATER MONITORING

GROUNDWATER SYSTEMS

- System must collect 1 sample at each entry point to the distribution system during the 3-year compliance period in effect when the state determines treatment is not needed, and it sets maximum permissible lead and copper levels
- System must collect 1 sample at each entry point to the distribution system during each subsequent 3-year compliance period

SURFACE WATER SYSTEMS

- System must collect 1 sample at each entry point to the distribution system annually
- The first year begins on the date the state determines treatment is not needed and it sets maximum permissible lead and copper levels

MONITORING PERIODS

GROUNDWATER SYSTEMS

- System must collect all source water samples and submit the results to the state by the following dates:

1st Compliance Period	January 1, 1996	January 11, 1996
2nd Compliance Period	January 1, 1999	January 11, 1999
3rd Compliance Period	January 1, 2002	January 11, 2002

SURFACE WATER SYSTEMS

- System must collect all source water samples and submit the results to the state by the following dates:

1st Year	January 1, 1996	January 11, 1996
2nd Year	January 1, 1997	January 11, 1997
3rd Year	January 1, 1998	January 11, 1998

FOLLOW-UP SOURCE WATER MONITORING FOR SMALL SYSTEMS INSTALLING SOURCE WATER TREATMENT

1997

FIRST MONITORING PERIOD — *January 1, 1997 to July 1, 1997*

SECOND MONITORING PERIOD — *July 1, 1997 to January 1, 1998*

- **If a system is not required to install source water treatment, it has 24 months to install and operate the treatment and 12 months to collect and submit follow-up source water samples.**

LEAD AND COPPER SOURCE WATER MONITORING

- **NUMBER AND FREQUENCY**
  - System must collect 1 sample at each entry point to the distribution system during each of 2 consecutive 6-month monitoring periods

MONITORING PERIODS

- **FIRST MONITORING PERIOD**
  - January 1, 1997 to July 1, 1997 (submit by July 11, 1997)
- **SECOND MONITORING PERIOD**
  - July 1, 1997 to January 1, 1998 (submit by January 11, 1998)

SOURCE WATER MONITORING REQUIREMENT AFTER THE STATE SETS MAXIMUM PERMISSIBLE LEAD AND COPPER LEVELS FOR SYSTEMS INSTALLING SOURCE WATER TREATMENT

1998

PERIOD FOR STATE DETERMINATION *January 1, 1998 to July 1, 1998*

- **After a system installs source water treatment, collects follow-up samples, and submits the results to the state, the state will set maximum permissible lead and copper levels.**
- **System must continue delivering finished water to each entry point to the distribution system with lead and copper concentrations below the levels set by the state to remain in compliance.**

LEAD AND COPPER SOURCE WATER MONITORING

- **GROUNDWATER SYSTEMS**
  - System must collect 1 sample at each entry point to the distribution system during the 3-year compliance period in effect when the state sets maximum permissible lead and copper levels
  - System must collect 1 sample at each entry point to the distribution system during each subsequent 3-year compliance period
- **SURFACE WATER SYSTEMS**
  - System must collect 1 sample at each entry point to the distribution system annually
  - The first year begins on the date the state sets maximum permissible lead and copper levels

MONITORING PERIODS

- **GROUNDWATER SYSTEMS**
  - System must collect source water samples and submit the results to the state by the following dates:

1st Compliance Period	January 1, 1999	January 11, 1999
2nd Compliance Period	January 1, 2002	January 11, 2002
3rd Compliance Period	January 1, 2005	January 11, 2005

- **SURFACE WATER SYSTEMS**
  - System must collect source water samples and submit the results to the state by the following dates:

1st Year	January 1, 1999	January 11, 1999
2nd Year	January 1, 2000	January 11, 2000
3rd Year	January 1, 2001	January 11, 2001

REDUCED MONITORING REQUIREMENTS FOR SMALL SYSTEMS NOT INSTALLING TREATMENT

2002

GROUNDWATER SYSTEMS	*Beginning January 1, 2002*
SURFACE WATER SYSTEMS	*Beginning January 1, 2002*

LEAD AND COPPER SOURCE WATER MONITORING

✦ **GROUNDWATER SYSTEMS**

- System that manitains lead and copper concentrations below the levels set by the state for 3 consecutive 3-year compliance periods may reduce source water monitoring to once per 9-year compliance cycle

✦ **SURFACE WATER SYSTEMS**

- System that maintains lead and copper concentrations below the levels set by the state for 3 consecutive years may reduce source water monitoring to once per 9-year compliance cycle

REDUCED MONITORING PERIODS

✦ **GROUNDWATER AND SURFACE WATER SYSTEMS**

- Reduced monitoring would take place in the second 9-year compliance cycle, which begins January 1, 2002 and ends January 1, 2011
- System must collect 1 sample at each entry point to the distribution system and submit the results to the state by January 11, 2011

REDUCED MONITORING REQUIREMENTS FOR SMALL SYSTEMS INSTALLING TREATMENT

GROUNDWATER SYSTEMS	*Beginning January 1, 2011*
SURFACE WATER SYSTEMS	*Beginning January 1, 2002*

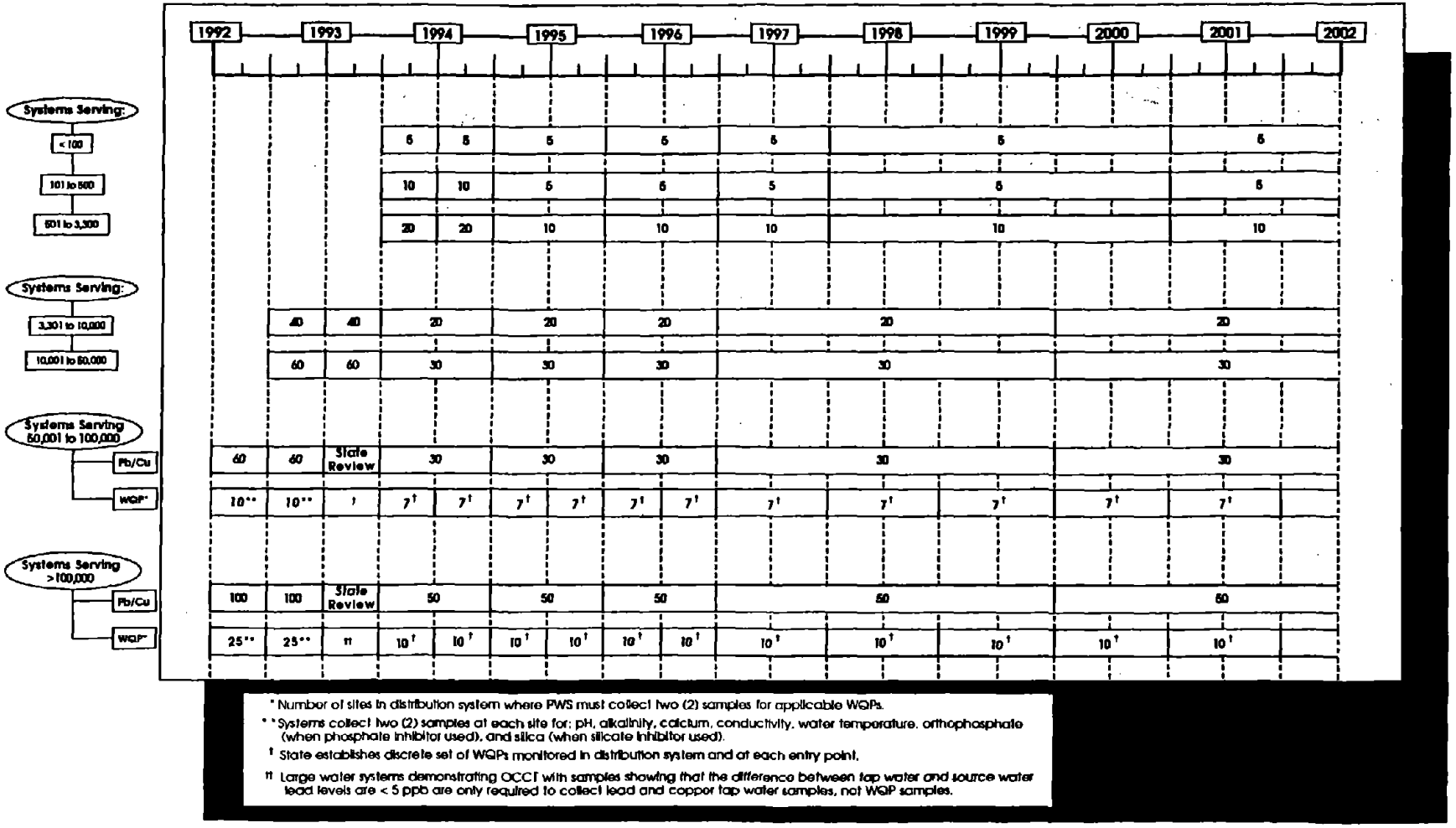
LEAD AND COPPER SOURCE WATER MONITORING

- **GROUNDWATER SYSTEMS**
  - System that manitains lead and copper concentrations below the levels set by the state for 3 consecutive 3-year compliance periods may reduce source water monitoring to once per 9-year compliance cycle
- **SURFACE WATER SYSTEMS**
  - System that maintains lead and copper concentrations below the levels set by the state for 3 consecutive years may reduce source water monitoring to once per 9-year compliance cycle

REDUCED MONITORING PERIODS

- **GROUNDWATER SYSTEMS**
  - Reduced monitoring would take place in the third 9-year compliance cycle, which begins January 1, 2011 and ends January 1, 2020
  - System must collect 1 sample at each entry point to the distribution system and submit the results to the state by January 11, 2020
- **SURFACE WATER SYSTEMS**
  - Reduced monitoring would take place in the second 9-year compliance cycle, which begins January 1, 2002 and ends January 1, 2011
  - System must collect 1 sample at each entry point to the distribution system and submit the results to the state by January 11, 2011

Number and Frequency of Tap Water Monitoring For Systems Demonstrating Optimal Corrosion Control Treatment Installed



* Number of sites in distribution system where PWS must collect two (2) samples for applicable WQPs.

** Systems collect two (2) samples at each site for: pH, alkalinity, calcium, conductivity, water temperature, orthophosphate (when phosphate inhibitor used), and silica (when silicate inhibitor used).

† State establishes discrete set of WQPs monitored in distribution system and at each entry point.

†† Large water systems demonstrating OCCT with samples showing that the difference between tap water and source water lead levels are < 5 ppb are only required to collect lead and copper tap water samples, not WQP samples.

SAMPLE SITE JUSTIFICATION/COLLECTION METHOD CERTIFICATION

System's Name: _____ Type: ☐ CWS ☐ NTNCWS

Address: _____

_____

_____

Size: ☐ >100,000
☐ 10,001 to 100,000
☐ 3,301 to 10,000
☐ 501 to 3,300
☐ 101 to 500
☐ ≤100

Telephone number: _____

System ID #: _____

Contact Person: _____

THE RESULTS OF LEAD AND COPPER TAP WATER SAMPLES MUST BE ATTACHED TO THIS DOCUMENT

# of samples required _____ **# of samples submitted** _____

TARGETING CRITERIA

# of single-family structures with copper pipes with lead solder installed after 1982 or lead pipes and/or lead service lines (Tier 1) _____

# of multi-family structures with copper pipes with lead solder installed after 1982 or lead pipes and/or lead service lines (Tier 1) _____

# of buildings containing copper pipes with lead solder installed after 1982 or lead pipes and/or lead service lines (Tier 2) _____

# of sites that contain copper pipes with lead solder installed before 1983 (to be used only if first condition has been exhausted) (Tier 3) _____

TOTAL _____

Explanation of Tier 2 and Tier 3 sites (attach additional pages if necessary)

_____

_____

LEAD SERVICE LINE SITES

# of samples required to be drawn from lead service line sites _____

# of samples actually drawn from lead service line sites _____

Difference (explain differences other than zero) _____

Method used to identify lead service line sites (attach additional pages if necessary):

_____

_____

THE RESULTS OF WATER QUALITY PARAMETER (WQP) SAMPLES MUST BE ATTACHED TO THIS DOCUMENT

# of samples required to be collected _____

# of WQP tap samples actually collected and submitted _____

# of WQP entry point samples required to be collected _____

# of WQP entry point samples actually collected and submitted _____

SAMPLE SITE JUSTIFICATION/COLLECTION METHOD CERTIFICATION

CERTIFICATION OF COLLECTION METHODS

I certify that:

Each first draw tap sample for lead and copper is one liter in volume and has stood motionless in the plumbing system of each sampling site for at least six hours.

Each first draw sample collected from a single-family residence has been collected from the cold water kitchen tap or bathroom sink tap.

Each first draw sample collected from a non-residential building has been collected at an interior tap from which water is typically drawn for consumption.

Each first-draw sample collected during an annual or triennial monitoring period has been collected in the months of June, July, August or September.

Each resident who volunteered to collect tap water samples from his or her home has been properly instructed by (insert water system's name) _____ in the proper methods for collecting lead and copper samples. I do not challenge the accuracy of those sampling results. Enclosed is a copy of the material distributed to residents explaining the proper collection methods, and a list of the residents who performed sampling.

CHANGE OF SAMPLING SITE

Original site address:

_____

_____

New site address:

_____

_____

Distance between sites (approximately): _____

Targeting Criteria: NEW: OLD:

Reason for change (attach additional pages if necessary):

_____

_____

_____

SIGNATURE _____

NAME TITLE DATE

Form 141-B

REQUEST FOR REDUCED LEAD AND COPPER TAP WATER MONITORING

System's Name: _____ **Type:** ☐ CWS ☐ NTNCWS

Address:
_____
_____
_____

Size:
☐ >100,000
☐ 10,001 to 100,000
☐ 3,301 to 10,000
☐ 501 to 3,300
☐ 101 to 500
☐ ≤100

Telephone number: _____

System ID #: _____

Contact Person: _____

REQUEST FOR REDUCTION

The _____ water system has continued to operate in accordance with the state-specified water quality parameters during each of the six-month monitoring periods ending _____. The above named water system hereby requests that the state permit the system to reduce lead and copper tap water monitoring from:

☐ Biannual to Annual

☐ Annual to Triennial

The results of all water quality parameter samples and lead and copper samples collected during each of the monitoring periods are enclosed. The data are summarized on page 2.

SIGNATURE _____

NAME	TITLE	DATE
_____	_____	_____

Suggested Directions for Homeowner Tap Sample Collection Procedures.

These samples are being collected to determine the contribution of faucet fixtures and household pipes and/or solder to the lead and copper levels in tap water. This sampling effort is required by the Environmental Protection Agency, and is being accomplished through the cooperation of homeowners and residents.

A sample is to be collected after an extended period of stagnant water conditions (i.e., no water use during this period) within the interior piping. Due to this requirement, either early mornings or evenings upon returning from work are the best times for collecting samples. The collection procedure is described in more detail below.

1. Prior arrangements will be made with the customer to coordinate the sample collection event. Dates will be set for sample kit delivery and pick-up by water department staff.
2. A minimum of 6-8 hour period during which there is no water use must be achieved prior to sampling. The water department recommends that either early mornings or evenings upon returning home are the best sampling times to ensure that the necessary stagnant water conditions exist.
3. A kitchen or bathroom cold-water faucet is to be used for sampling. Place the sample bottle (open) below the faucet and gently open the cold water tap. Fill the sample bottle to the line marked "1000-mL" and turn off the water.
4. Tightly cap the sample bottle and place in the sample kit provided. Please review the sample kit label at this time to ensure that all information contained on the label is correct.
5. IF ANY PLUMBING REPAIRS OR REPLACEMENT HAS BEEN DONE IN THE HOME SINCE THE PREVIOUS SAMPLING EVENT, NOTE THIS INFORMATION ON THE LABEL AS PROVIDED.
6. Place the sample kit outside of the residence in the location of the kit's delivery in order that department staff may pick up the sample kit.
7. Results from this monitoring effort will be provided to participating customers when reports are generated for the State unless excessive lead and/or copper levels are found. In those cases, immediate notification will be provided (usually 10 working days from the time of sample collection).

Call _____ at _____ if you have any questions regarding these instructions.

TO BE COMPLETED BY RESIDENT

Water was last used: Time_____ Date_____
Sample was collected: Time_____ Date_____

I have read the above directions and have taken a tap sample in accordance with these directions.

_____ Date_____
Signature

Appendix B

Additional Suggestions for a Materials Survey and Sampling Plan

The Rule specifies that a materials survey must be performed only to the extent that a "sufficient number of Tier 1 sites be identified". Since some investigation is warranted, PWSs may want to consider performing a comprehensive material survey to document all material types found in the distribution and home plumbing systems.

B.1 Benefits of a Comprehensive Materials Program

A comprehensive material survey can be a valuable tool to water systems. The piping and appurtenance materials in-place contribute to the hydraulic and water quality conditions found in the distribution system. By documenting the existing conditions through a materials survey, PWSs can build upon that foundation in tracking distribution system characteristics over time.

The benefits which PWSs may receive by performing a comprehensive materials survey and developing an on-going materials program are:

- assistance with development of the distribution system sampling plan for all water quality parameters, including those pertinent to other regulatory actions such as total coliforms, chlorine residual, and total trihalomethanes.
- organization and implementation of a Lead Service Line Replacement Program, should one be required; and,
- evaluation and analysis of the overall corrosion control program performance and its potential effects on particular areas of the distribution system.

Many utilities have a materials program already in place. If not, a PWS may be well served the by the establishment of such a program. The key elements of a successful material program consists of documenting all current replacement and report work as to the date, location, existing material and conditions, replacement material, and extent of the work completed. The use of distribution system mapping is a beneficial component for tracking the material program information along with water quality and hydraulic performance of the distribution system.

Identifying the types of pipe and fixture materials used throughout the service area may also assist PWSs in developing a corrosion control program which addresses all of the corrosion concerns for the system. Additionally, a complete description of the distribution system materials will permit a better understanding of the changes in key water quality parameters which control corrosion throughout the distribution system. Identification of lined and unlined cast iron, lead, asbestos cement, brass, gunmetal, galvanized steel, copper, and plastic distribution system materials should be considered for inclusion in a comprehensive material survey.

B.2 Identification and Characterization of Materials

Using the information obtained through the resources investigation discussed in Section 3.3 of this manual, PWSs may identify and characterize the service area by the type of construction, service connection, distribution system pipe material(s), age, and length of pipe found in the distribution system.

Table B-1 may be used to organize this data by distribution system region (to be identified by the PWS) and the type of material found for distribution system mains and service lines. For illustration purposes, the regions shown in Table B-1 may refer to different pressure zones located within the distribution system. Oftentimes multiple sources of supply enter distribution systems in different pressure zones, potentially creating differences in expected water quality conditions. For other systems, the pressure zones may reflect differing periods of the distribution system's development, and as such, the predominant materials present and their general condition may vary according to the pressure zone.

Table B-2 presents survey results in terms of the number of service connections with lead service lines and the targeted interior plumbing conditions by region of the distribution system. This information could assist PWSs in selected a representative number of targeted sample sites based on their distribution throughout the service area.

The material survey results required to generate Tables B-1 and B-2 would be useful to PWSs in completing the material survey summary (Table 3-3) pertinent to the requirements of the Lead and Copper Rule explicitly.

It is recommended that PWSs update the material survey information every five years. The addition of standard operating procedures (SOPs) for distribution system maintenance operations—to include a data management component for inputing, accessing, and analyzing information more easily—could provide adequate information for updating the material survey information. With regard to interior plumbing conditions, the PWS may formulate an agreement with the agency responsible for plumbing permits to receive (1) compiled information on new construction/remodeling with copper pipe; and, (2) results of building inspections regarding the lead ban provisions.

B.3 Creating a Material Survey Database

Maintaining a material survey database will be an important element in the continued updating process for the survey information. Some suggested variables to be included in a database are discussed below. Spreadsheet or database management software packages, may be used to handle such information. It is assumed that this database is relevant only to those sites/connections which could potentially enter the utility's sampling plan. It is not intended that this extensive amount of information be collected for each connection to the system.

- **Connection Identifier**: An identification number assigned to each connection to the distribution system. For many systems, this item already exists in the accounting or billing information internal to the water

supplier, such as a meter number or account number.

- **Billing Address and Information**: Street address, zip code, resident/owner name as may be contained in the billing information for the system.
- **Region of Distribution System**: Identifier for region of the distribution system service area per the sampling plan developed by the utility. An alphanumeric character which codes for sorting purposes those connections within each area of the distribution system of a particular characteristics as developed by your sampling plan.
- **Target Level within Sample Pool**: Based on the specified priorities within the Lead and Copper Rule, note for each connection its level of priority as a targeted sample. Table B-3 provides a suggested priority level based on the material characteristics of sites. For example, a SFR connection with copper plumbing with lead solder installed after 1983 and being served by a lead service line would be a 1 (highest priority), while a commercial building (BLDG) with galvanized pipe built before 1983 and not serviced by a lead service line would be a 50 (lowest priority). This variable would provide the utility with a clear delineation of those targeted sites of certain priorities and their location within the service area.
- **Inspected for Service Line Connection Type**: Yes/No answer as to whether the service line connector material was identified by an inspection of the pipe. This would represent the highest degree of certainty regarding the pipe material.
- **Inspected for Interior Plumbing Materials**: Yes/No answer as to whether utility or City/Municipality physically inspected the interior plumbing materials. This is especially important with respect to lead solder used in copper plumbing.
- **Date of Original Construction**: The date of a structure's original construction can assist the utility in evaluating the possible service connection materials which may have been used. This also separates those SFRs with copper plumbing after 1983 which represent new construction versus rehabilitation projects within the service area.
- **Date of Remodeling Permit Application**: For those sites where copper plumbing was replaced, the date of its installation may be assumed to be that of its plumbing permit application.
- **Service Line Materials**: Two sets of information are needed under this entry: those service line materials owned by the utility and those owned by the structure's owner per service connection. There may be multiple materials for any single connection owned by either or both parties. Enough flexibility must be designed into the database to accommodate this condition.
- **Home Plumbing Materials**: The plumbing materials of interest are those used from the service connection's entrance to the structure to the kitchen tap where samples are collected. There may be several different materials encountered along this pathway, and again, flexibility must be designed into the database.

- **Distribution System Materials:** The distribution system materials of interest in this entry do not need to be specific, and in some cases, may not apply at all. It may be useful for certain water suppliers to distinguish parts of their distribution system by the general type of pipe material used, such as lined cast iron, unlined cast iron, asbestos/cement, plastic, etc.

B.4 Suggestions for a More Detailed Sampling Plan

If a PWS meets the Tier 1 requirements, the sampling plan is submitted to the State with the initial monitoring results. PWSs must notify the State prior to beginning initial monitoring of the reasons for selecting Tier 2 or Tier 3 sites, or including less than 50% of the minimum number of sites as LSLs when they are present.

A distribution system map detailing additional information about the PWS sampling program should be submitted to the State. It may prove useful in fully describing the PWS sample plan. The following information should be presented on the map:

- Sites for lead and copper tap samples with sample site identification codes such as SFR>82, SFR-Pb, SFR-LSL, MFR>82, BLDG-Pb, etc.
- Sampling sites for water quality parameters in the distribution system. Coliform monitoring sites used by the system should be indicated on the map as well since disinfectant residual measurements will be taken at these locations as well.
- Sites used for the collection of total trihalomethane samples.

The distribution system map should also indicate the service area zones and any sub-regions which the utility may use to indicate differences in distribution system pipe materials, flow conditions, or blending of water sources.

Table B-1. Distribution System Material Characterization

PWS FRDS NUMBER

POPULATION SERVED BY PWS

REGIONAL OF DISTRIBUTION SYSTEM	TYPE OF PLUMBING MATERIAL IN DISTRIBUTION SYSTEM					
	SERVICE LINES		MAINS			
	NUMBER OF CONNNECTIONS		TOTAL LENGTH OF PIPE IN FEET			
	LEAD	OTHER	A/C PIPE	UNLINED IRON	LINED IRON	OTHER
Region 1						
Region 2						
Region 3						
Region 4						

Table B-2. Material Survey Results by Number of Service Connections for Each Plumbing Material Type

PWS FRDS NUMBER

POPULATION SERVED BY PWS

REGION OF DISTRIBUTION	TYPE OF PLUMBING MATERIAL					
	INTERIOR PLUMBING				DISTRIBUTION SYSTEM PIPING	
	LEAD PIPE	COPPER >1982	COPPER <1983	OTHER	LSLs	
					ENTIRE LINE	PARTIAL LINE
	NUMBER OF SERVICE CONNECTIONS				NUMBER OF SERVICE CONNECTIONS	
REGION1 MSFRs						
MFRs						
BLDGs						
SUBTOTAL						
REGION2 MSFRs						
MFRs						
BLDGs						
SUBTOTAL						

Table B-3. Suggested Priority Levels for Service Connections Based on Material Characteristics for PWSs in Sample Pool Categories A-E*

Sample Pool Category	Priority Level	Material Characteristic of Site
A-C	1	SFR with copper with lead solder installed after 1982 served by LSL
		SFR with interior lead plumbing and LSL
A-C	2	SFR with copper with lead solder installed after 1982 without LSL
		SFR with interior lead plumbing without LSL
A-C	3	SFR served by LSL
D	11	MFR with copper with lead solder installed after 1982 and LSL
		MFR with lead interior piping and LSL
D	12	MFR with copper with lead solder installed after 1982 without LSL
		MFR with lead interior plumbing without LSL
D	13	MFR served by LSL
D	21	BLDG with copper with lead solder installed after 1982 and served by LSL
		BLDG with interior lead plumbing and LSL
D	22	BLDG with copper with lead solder installed after 1982 but before lead ban without LSL
		BLDG with interior lead plumbing without LSL
D	23	BLDG served by LSL
E	30	SFR with copper with lead solder installed before 1983 without LSL
--	50	Other structures — No targeting criteria met

* This prioritization does not apply to exceptional cases, Category F.